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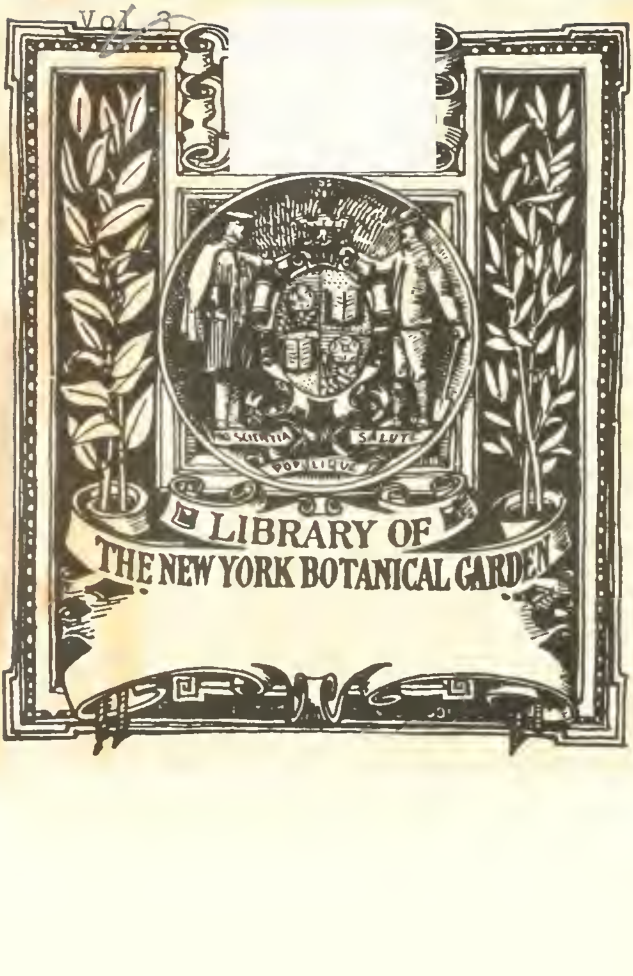
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FLORA OF CALIFORNIA

JEPSON

Part 1, pp. 17-128, issued 31 May. 1939.
Part 2, pp. 129-464, issued 5 May. 1943.

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SYMPETALAE HYPOGYNEAE

Calyx usually present. Corolla usually present, its petals more or less united into a tube (rarely choripetalous). Ovary superior (rarely inferior).

LENNOACEAE. Lennoa Family

Root-parasitic brown herbs with fleshy stems and scale-like leaves. Flowers perfect, in spikes or heads. Calyx parted into narrow nearly distinct segments. Corolla tubular, the border 5 to 7-lobed. Stamens as many as the lobes of the corolla, inserted on its throat. Ovary fleshy, 6 to 14-celled, each 2 cells representing one true cell divided by a false partition; style 1; stigma crenulate or obscurely lobed. Fruit concealed in the persistent calyx and corolla, finally splitting into 12 to 28 1-seeded nutlets.—Genera 3, species 5, southwestern United States and Mexico.

Bibliog.—Palmer, Edw., Sand Food (Rept. U. S. Com. Agr. for 1870:424,—1871). Gray, A., Lennoaceae in Syn. Fl. 2:50–51 (1878). Orcutt, C. R., [Notes on] Lennoaceae (West Am. Sci. 6:137,—1889). Drude, O., Lennoaceae (Engler and Prantl, Nat. Pflzfam. 4^1:12–15, fig. 7,—1897).

Flowers in a spike; calyx-segments glandular-puberulent..1. Pholisma.
Flowers in a saucer-shaped head; calyx-segments plumosely hairy..........................2. Ammobroma.

1. PHOLISMA Nutt.

Stem simple, ending in a simple or compactly branched dense spike. Sepals 5, 6 or 7, naked. Corolla border undulate-plicate, spreading, shallowly 5, 6 or 7-lobed, each lobe emarginate.—Species 1. (Greek pholis, a scale, referring to the scaly stem.)

1. **P. arenarium** Nutt. Plant erect, 6 to 10 inches high; spikes oblong, rarely capitate, 1 to 5 inches long; corolla purplish with white border, 2 lines broad.

Sandy flats, mesas, dunes or beaches, 5 to 2200 feet: coast line from San Luis Obispo Co. to San Diego Co.; Mohave and Colorado deserts. South to Lower California. Dec.-June.

Locs.—Pholisma arenarium is parasitic on the roots of certain shrubs such as Eriogonum parvifolium, Ericameria ericoides, Chrysothamnus nauseosus var. graveolens and Eriodictyon crassifolium. At Manhattan Beach, north of Redondo Beach, it occurs on the two shrubs first mentioned, and also on the herb Abronia umbellata. The following stations validate the indicated range. Coast line: Morro Bay, San Luis Obispo Co., *E. N. Wilcox;* Santa Monica, *J. J. Rivers:* Manhattan Beach, Los Angeles, *T. W. Minthorn;* San Diego. Mohave Desert: Freeman, Indian Wells Valley, *Hall & Chandler* 7368; Lancaster, *Pringle;* Mohave sta.; Kramer, *Elizabeth DeWolf;* Barstow, *Mary Beal;* Old Woman Sprs., *Jepson* 5947. Colorado Desert: Pleasant Valley, Lookout Mt., n. of Indio, *Jepson;* Borrego Sprs.; Myers Creek bridge, foot of Mountain Springs grade, *Jepson* 11,791.

Refs.—Pholisma arenarium Nutt.; Hook., Icon. Pl. t. 626 (1844), "Monterey and San Diego," *Nuttall* (but not found at Monterey since Nuttall's day, therefore probably an error); Jepson, Man. 734 (1925). *P. depressum* Greene, Bull. Cal. Acad. 1:198 (1885), type loc. Cape San Quentin, L. Cal., *Greene.*

2. AMMOBROMA Torr.

Stem simple, ending above in a saucer-shaped head densely clothed with flowers. Sepals 6 to 10, filiform, plumosely hairy, as long as the corolla or somewhat longer. Corolla purple, tubular, 6-lobed, the lobes very short, emarginate.—Species 1. (Greek ammos, sand, and broma, food.)

1. **A. sonorae** Torr. Sand Food. (See Frontispiece.) Plant buried in the sand up to the very woolly head; head like a mushroom in shape, 3¼ inches in diameter.

Sandhills, 25 to 550 feet: southeastern Colorado Desert. South to Lower California and Sonora, east to Arizona. May.

Field note.—The stem descends in the sand to a considerable depth, about 2 to 4 feet. In 1916 J. Tilley discovered a plant on the Colorado Desert at a point about 20 miles east of Brawley (east of the "East Highline"). He dug down 4 feet, following the stem, without coming to the root which consists of a mass of fibers where attached to the root of the host plant. The stem, chiefly below ground therefore, thickens upward and becomes ½ to 1½ inches in diameter and is fleshy.

The original discoverer, A. B. Gray, found the plant in 1854 while engaged on a transcontinental railroad survey. His account of it may be abstracted as follows: The whole plant except the top is buried in the sand. It is very abundant in the sandhills which stretch from Adair Bay around the head of the Gulf of California and forms one of the principal sources of food of the Papago Indians who eat the fleshy stems boiled or roasted. So prepared, Gray described the freshly cooked plant as "luscious" and resembling in taste the sweet potato, only far more delicate (Ann. Lyc. Nat. Hist. N. Y. 8:53–54). Edward Palmer thought the taste of it was like that of the heart of a cabbage (West Am. Sci. 6:137). In California Ammobroma sonorae is a rare plant, but collections have been made at Meloland (Bot. Gaz. 65:340), near Hedges Mine, Ogilby (*A. L. Stockton*), and Grays Well, Algodones Sandhills, acc. *Kearney*.

Refs.—AMMOBROMA SONORAE Torr., Ann. Lyc. Nat. Hist. N. Y. 8:52, pl. 1 (1867), type loc. sandhills about Adair Bay, Sonora, Mex., *A. B. Gray;* Jepson, Man. 735 (1925).

ERICACEAE. HEATH FAMILY

Trees, shrubs or perennial herbs. Leaves simple, alternate in all our genera except four, mostly evergreen and stiff and coriaceous. Flowers white or red, regular and symmetrical, with the parts in 5s, rarely in 4s. Calyx 5 (or 4)-lobed or -parted, or consisting of 5 (or 4) distinct or nearly distinct sepals. Corolla sympetalous, rarely choripetalous. Stamens free from the corolla, as many or commonly twice as many as its lobes or petals and distinct from them; anthers 2-celled, opening by a terminal pore or sometimes longitudinally, frequently bearing two awn-like appendages. Ovary superior or inferior, 4 to 10 (rarely 1, 2 or 3)-celled, with usually axile placentae bearing numerous ovules. Style 1; stigma 1, entire or merely lobed.—Flowers often pendulous. Leaves opposite in Kalmia, Cassiope, Chimaphila and Moneses. Rhododendron has a slightly irregular corolla, Allotropa has none.—Genera 77, species 1400, all continents.

Bibliog.—MacDougal, D. T., Symbiotic Saprophytism (Pterospora), (Ann. Bot. 13:31–38,—1899). Fernald, M. L., Pyrola asarifolia Michx. var. incarnata (Rhod. 6:178–179,—1904); The Alpine Bearberries and the generic status of Arctous (Rhod. 16:21–32,—1914). Andres, H., Beiträge zur Kenntnis der Pyrolaceae (Fedde, Rep. 10:134–144,—1911). Davidson, J., Newberrya congesta Torr. (First Rep. Brit. Columbia Bot. Office 26–28,—1913). Blake, S. F., Moneses uniflora var. reticulata (Rhod. 17:28–29,—1915); Variations of Chimaphila umbellata (Rhod. 19: 237–244,—1917). Dahl, A., Allotropa virgata (Madroño 1:62,—1917). Henderson, Margaret W., Comparative study of the structure and saprophytism of the Pyrolaceae and Monotropaceae with reference to their derivation from the Ericaceae (Contrib. Bot. Lab. Univ. Penn. 5:42–109,—1919). Jepson, W. L., Pleuricospora fimbriolata in the Santa Cruz Mts. (Nemophila 11:43–44,—1920); Variation in Hemitomes congestum (l.c. 11:44,—1920). Wilson, E. H., & Rehder, A., A monograph of Azaleas (Arnold Arboretum Publ. 9:1–219,—1921). White, P. J., Great abundance of pine drops and snow plant (Yos. Nature Notes 9:78,—1930). Abrams, L. R., The Dwarf Gaultherias in California (Madroño 2:121–122,—1934). Copeland, H. F., The structure of the flower of Newberrya (Madroño 2:137–142,—1934); On the genus Pityopus (Madroño 3:154–168,—1935); The reproductive structures of Pleuricospora (Madroño 4:1–16,—1937); The structure of Allotropa (Madroño 4:137–153,—1938).

A. Shrubs or trees (often small or diminutive shrubs); leaves alternate (except in Kalmia and Cassiope); corolla sympetalous (except Ledum).

- Ovary wholly superior.—Subfamily ERICINEAE.
  - Fruit a dry capsule.
    - Anthers awnless; capsule septicidal.
      - Corolla with distinct petals; leaves resin-dotted beneath.................... ....1. LEDUM.

Corolla sympetalous (as in all the following).
Large shrubs with broad leaves; leaf-buds scaly.
Corolla funnelform, 5-lobed .... 2. Rhododendron.
Corolla cylindric-urnshaped, 4-lobed .... 3. Menziesia.
Diminutive alpine or subalpine shrubs with narrow small leaves; no scaly leaf-buds.
Corolla saucer-shaped with 10 pockets holding the anthers .... 4. Kalmia.
Corolla open-campanulate, without pockets .... 5. Phyllodoce.
Anthers awned or mucronate; capsule loculicidal.
Corolla cup-shaped; anthers awned; leaves scale-like, imbricated, sessile .... 6. Cassiope.
Corolla ovate with narrow orifice; anthers not awned, merely mucronate; leaves broad, petioled .... 7. Leucothoe.
Fruit a berry or drupe.
Calyx tubular, becoming fleshy in fruit and enclosing the capsule; anthers awned or awnless; flowers in a raceme or solitary .... 8. Gaultheria.
Calyx with distinct sepals, dry, persistent in fruit but insignificant; anthers awned; fruit a berry or berry-like.
Surface of fruit granular or warty.
Flowers in a panicle; calyx glabrous .... 9. Arbutus.
Flowers in a raceme; calyx tomentose .... 10. Comarostaphylis.
Surface of fruit smooth or sometimes merely glandular; flowers in a panicle, rarely in a raceme .... 11. Arctostaphylos.
Ovary wholly inferior.—Subfamily Vaccinieae .... 12. Vaccinium.

B. Herbs or herb-like plants; corolla choripetalous (except nos. 19, 20 and 21); anthers without awns (except no. 19).

Plants with evergreen leaves (one species leafless); leaves in whorls or basal; corolla choripetalous.—Subfamily Pyrolineae.
Stems leafy; flowers corymbose; filaments with a conspicuous roundish dilation; style short. 13. Chimaphila.
Stems leafy at base only; filaments not dilated; style commonly elongated.
Flowers solitary; stigma with 5 radiating lobes .... 14. Moneses.
Flowers racemose; stigma 5-lobed or -toothed .... 15. Pyrola.
Humus plants or saprophytes without green leaves; leaves replaced by alternate scales.—Subfamily Monotropeae.
Ovary 4 to 7-celled.
Corolla none; stems streaked red and white .... 16. Allotropa.
Corolla present.
Corolla choripetalous; ovary seated on an 8 to 12-toothed disk, the teeth deflexed.
Stems 1-flowered .... 17. Monotropa.
Stems several-flowered .... 18. Hypopitys.
Corolla sympetalous; disk none.
Anthers awned; corolla 2½ lines long .... 19. Pterospora.
Anthers not awned; corolla 6 to 9 lines long .... 20. Sarcodes.
Ovary 1-celled.
Corolla sympetalous; sepals mostly 2; flower parts hairy .... 21. Newberrya.
Corolla with distinct petals; sepals 4 or 5, glabrous.
Filaments glabrous; corolla glabrous; inflorescence a dense spike .... 22. Pleuricospora.
Filaments hairy; corolla hairy within; inflorescence a pyramidal raceme .... 23. Pityopus.

1. LEDUM L. Labrador Tea

Evergreen shrubs with fragrant herbage. Leaves alternate, entire, the margin disposed to be revolute. Flowers white, small, in terminal umbel-like corymbs from large scaly buds. Pedicels slender. Sepals 5, almost distinct, very small. Petals 5, distinct, obovate, spreading. Stamens 5 to 10. Capsule 5-celled, dehiscing from the base upward, many-seeded; placentae borne on the summit of the axis of the fruit.—Species 3, North America, Europe and Asia. (Greek Ledon, ancient name of the Cistus.)

1. **L. glandulosum** Nutt. Trappers Tea. (Fig. 280.) Low, 2 to 5 feet high; leaves thickly clothing the stems, the blades oblong, acute at each end, mucronate at apex, 1 to 2½ inches long, green and glabrous on both sides, or light-colored

beneath with a gland-dotted felt; petals elliptic-ovate, 2½ to 3 lines long; stamens 10; filaments ciliate toward the base; capsules oval, 2 lines long; pedicels recurved in fruit.

Colonizing borders of wet meadows, lake shores or marshy places: Sierra Nevada, 4000 to 9000 (or 11,000) feet, from Tulare Co. to Lassen Co.; along the coast, 20 to 500 feet, from the Santa Cruz Mts. to Del Norte Co. North to Oregon and thence east to the Rocky Mts. June-July. Poisonous to sheep.

Locs.—Sierra Nevada: Mt. Silliman, Tulare Co., *Hopping* 317; Williams Mdw., Kings River, *Jepson* 760; Huntington Lake, *Ferguson* 395; Kaiser Ridge, *Jepson;* Bloody Cañon, Mono Co., *Jepson;* Mt. Lyell, *Jepson* 3352; Soda Springs Cañon, Kennedy Lake, Tuolumne Co., *A. L. Grant* 505; Pacific Valley, Alpine Co., *Jepson* 10,158; Heather Lake, Eldorado Co., *Jepson* 8166; Lake Angeline, Placer Co., *Sonne* 207; Castle Peak, Nevada Co., *Sonne;* Scales Diggings, Sierra Co., *C. B. Bradley;* Mineral, Tehama Co., *J. Grinnell;* Lassen Creek, Lassen Co., *R. M. Austin* 145. Coast Ranges: Boulder Creek, Santa Cruz Co., *C. A. Reed;* Inverness, Marin Co., *Jepson* 8306; Pitkin swamp, Sonoma Co., *M. S. Baker;* Ft. Bragg, *W. C. Mathews* 117; Big Lagoon, Humboldt Co., *Tracy* 6728; Gasquet, Del Norte Co., *Davy.*

Refs.—LEDUM GLANDULOSUM Nutt., Trans. Am. Phil. Soc. ser. 2, 8:270 (1843), type loc. "Thornberg's ravine," central chain of the Rocky Mts., *Nuttall;* Jepson, Fl. W. Mid. Cal. 369 (1901), ed. 2, 311 (1911), Man. 740, fig. 722 (1925).

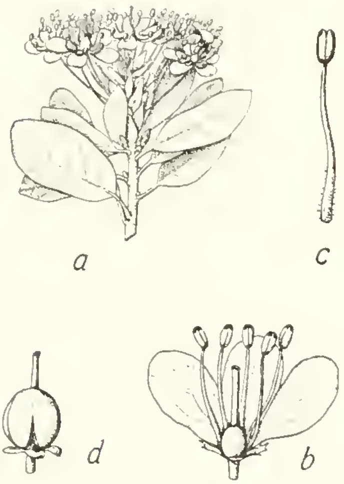

Fig. 280. LEDUM GLANDULOSUM Nutt. *a*, flowering branchlet, × ¾; *b*, long. sect. of fl., × 2; *c*, stamen, × 4; *d*, capsule, × 2.

2. **RHODODENDRON** L.

Ours shrubs with alternate entire leaves crowded on the flowering branches. Flowers in umbels or corymbs, from terminal buds with thin deciduous scales. Calyx small. Corolla funnelform to campanulate, cleft, often somewhat irregular. Stamens 5 or 10. Style filiform; stigma capitate or somewhat lobed. Fruit a septicidal 5-celled capsule, the valves separating from the columella.—Species about 100, North America, Europe and Asia. (Greek rhodos, rose, and dendron, tree.)

Deciduous; flowers commonly white; stamens 5, exserted........1. *R. occidentale.*
Evergreen; flowers rose-pink; stamens 10, included........2. *R. californicum.*

1. **R. occidentale** Gray. WESTERN AZALEA. (Fig. 281.) Loosely or widely branching shrub 3 to 8 (rarely to 14 or 21) feet high; leaves thin, the blades narrowly or broadly obovate, 1 to 4 inches long, ciliate, otherwise nearly glabrous; calyx 5-parted, its lobes ovate or oval, ciliate, 1 to 2 (or 3) lines long; corolla white or sometimes pink, 1½ to 1⅞ inches long, 5-cleft, slightly irregular, the upper lobe with a large yellow splotch, the tube funnelform, glandular-viscid outside; ovary densely pubescent with whitish gland-tipped hairs.

Stream banks or moist flats, rarely on open slopes, rather common: Cuyamaca, Palomar and San Jacinto mountains, 5000 to 6000 feet; Sierra Nevada, 3500 to 7500 feet, in Kern Co. and from Fresno Co. to eastern Siskiyou Co.; Coast Ranges (excepting the inner ranges), 50 to 4800 feet, from San Benito Co. to Del Norte Co. North to southwestern Oregon. May-July.

Geog. note.—Though so widely spread in montane country throughout the state, there are curious gaps in the distribution of Rhododendron occidentale. It is not known in the Kaweah River basin, although found northward and southward in the Sierra Nevada. While it occurs in the chain of mountains facing the Colorado Desert, from the Cuyamaca Mts. to the San Jacinto Mts., it is apparently absent from the San Bernardino, San Gabriel, Santa Inez and Santa Lucia ranges, in all of which there would seem to be favorable habitats. The shrub sprouts from the root-crown or stump when the top is destroyed. The flowers have a somewhat distinctive odor. Sheepmen justly fear the herbage as poisonous to their flocks.

Locs.—S. Cal.: Cuyamaca Mts., *Palmer* 213; Mesa Grande, San Diego Co., *E. Ferguson* 108; Palomar Mt., *Parish* 4408; Dark Cañon, San Jacinto Mts., *Jepson* 2271. Sierra Nevada: Cane Sprs., Black Mt., Greenhorn Mts., acc. *Charlotte N. Smith;* Millwood, Fresno Co., *Culbertson* 4693; Shaver Lake, Fresno Co., *Jepson* 13,283; Fresno Big Trees, Madera Co., *Jepson* 15,975; Merced Big Trees, *Jepson* 14,669; Hetch-Hetchy, *Jepson;* Big Creek, Tuolumne Co., *Jepson* 8343; Dorrington, Calaveras Co., *Jepson* 10,198; Stirling, Butte Co., *Heller* 10,800; Cedar Run, Shasta Co., *Baker & Nutting;* Shasta Sprs. Siskiyou Co., *Jepson* 14,671. Coast Ranges: Fremont Peak, Gabilan Range, *Elmer* 4748; Big Basin, Santa Cruz Mts., *Jepson;* Butano Creek, San Mateo Co., *Elmer* 4298; Mill Valley, Marin Co., *Jepson* 14,670; Howell Mt., *Jepson* 17,596; betw. Melburne and Comptche, Mendocino Co., *Jepson* 2231; Horse Mt., Humboldt Co., *Tracy* 7663; Castle Lake, e. slope Trinity Mts., *Condit;* Scott River valley, Siskiyou Co., *T. H. Gilbert;* Smith River, Del Norte Co., *Jepson.*

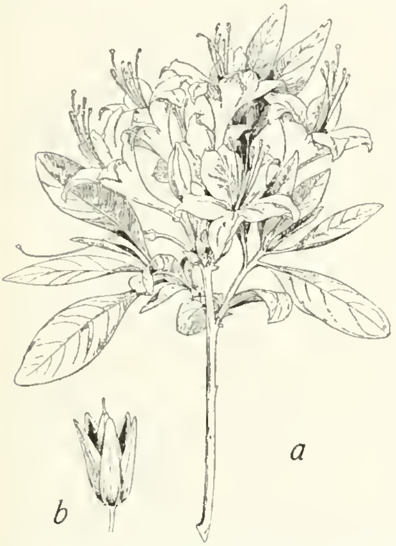

Fig. 281. RHODODENDRON OCCIDENTALE Gray. *a,* fl. branchlet, × ⅓; *b,* capsule, × ⅔.

Var. **sonomense** Rehd. Leaf-blades ¾ to 1 inch long; corolla rose-pink or white, the upper segment with a salmon-colored oblong spot in the middle.—Cañons, 500 to 1000 feet: east side of the Napa Range from Mt. St. Helena south to Butts Cañon, *Jepson* 15,697. Attributed by E. L. Greene to the "neighborhood of Petaluma," an unlikely locality.

Var. **paludosum** Jepson. Habit more compact; leaf-blades 1¼ to 1¾ inches long; flowers more numerous; calyx-lobes linear-oblong; corolla usually pink outside, white or slightly pinkish inside, except the yellowish upper lobe.—Damp places on hillsides and terraces near the ocean, 5 to 100 feet: middle Humboldt coast to the Del Norte coast. The flowers are without odor.

Refs.—RHODODENDRON OCCIDENTALE Gray, Bot. Cal. 1:458 (1876); Jepson, Fl. W. Mid. Cal. 369 (1901), ed. 2, 311 (1911), Man. 741, fig. 723 (1925). *Azalea occidentalis* T. & G., Pac. R. Rep. 4:116 (1857), type loc. "Laguna de Santa Rosa," Sonoma Co., *Bigelow. R. calendulaceum* H. & A., Bot. Beech. 362 (1838), based on Douglas plants from Cal.; not R. calendulaceum Torr. (1824). *Azalea californica* T. & G.; Dur., Jour. Acad. Phila. ser. 2, 3:94 (June, 1855), type loc. Deer Creek, Nevada City, *Pratten;* not R. californicum Hook. (1855). Var. SONOMENSE Rehd.; Wilson & Rehder, Monog. Azaleas 127 (1921). *R. sonomense* Greene, Pitt. 2:172 (1891), type loc. Mt. St. Helena (locality first cited), *Greene.* Var. PALUDOSUM Jepson, Man. 741 (1925), type loc. Loleta (not "Fortuna"), Humboldt Co., *Jepson* 1916.

2. **R. californicum** Hook. CALIFORNIA ROSE BAY. (Fig. 282.) Rather closely erect shrub 4 to 8 feet high, or in the northern Redwoods a small tree up to 26 feet high; leaves coriaceous and evergreen, the blades oblong or elliptic, shortly acute, green above, rusty or lighter beneath, 2½ to 5½ inches long; calyx 5-lobed, its lobes obtuse, ½ line long; corolla turbinate-campanulate, rose-pink, 1¼ inches long, its broad lobes undulate, the upper lobe greenish-dotted within; ovary densely red-silky.

Moist hillslopes or in forest shade, 20 to 3000 feet: along the coast from Monterey Co. to Del Norte Co. North to Washington. Apr.-June.

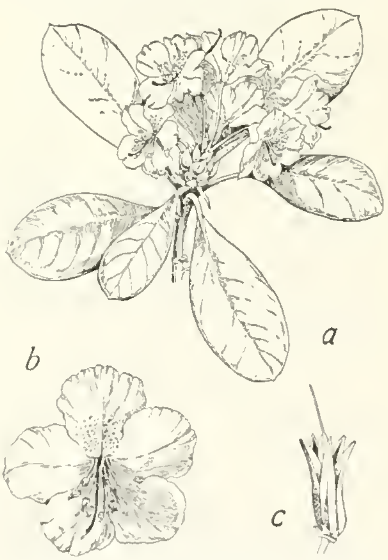

Fig. 282. RHODODENDRON CALIFORNICUM Hook. *a,* fl. branchlet, × ⅓; *b,* fl., × ½; *c,* capsule, × ⅔.

Field note.—Rhododendron californicum is very common in the great coastal Redwood belt between Klamath River and Crescent City. It is especially abundant just north of Wilson Creek, where for six miles it is the dominant on the forest floor. Highly developed in this region, the individuals range from 10 to 15 feet in height, or even up to 26 feet. The understory often forms an almost perfect canopy and when in flower in June there is presented to the traveler an impressive spectacle of the Redwood area. This species also occurs in the chaparral formation on Mt. Tamalpais, on French Camp Ridge in Humboldt Co. and in Del Norte Co. In the north it is in such situations (says J. P. Tracy) a bush about 6 feet tall and quite different in habit from the straggling tree-like shrubs of the dense forest belt.

Locs.—Malpaso Creek, Monterey coast, *H. A. Greene;* Waddell Creek, Santa Cruz Mts.; Mt. Tamalpais (ridge w. of Mill Valley), comm. *Adeline Frederick;* Ft. Bragg, *Jepson;* betw. Kenny and Usal, Mendocino Co., *Jepson* 2222; Trinidad, Humboldt Co., *Geo. B. Parrish;* Mud Sprs., Trinity Summit, *Davy* 5762; Prairie Creek, *Jepson;* Crescent City (e. of), *Goddard* 383; Gasquet, *Tracy* 12,373.

Refs.—RHODODENDRON CALIFORNICUM Hook., Bot. Mag. t. 4863 (July 1, 1855), type from Cal., *Lobb;* Jepson, Fl. W. Mid. Cal. 369 (1901), ed. 2, 311 (1911), Man. 741, fig. 724 (1925).

3. **MENZIESIA** Sm.

Shrubs with alternate deciduous leaves. Winter buds terminal, the scales strigose-chaffy. Flowers greenish-purple, appearing with the leaves but from separate buds and borne in clusters on nodding pedicels. Calyx small, flattish, bristly-ciliate, usually 4-lobed, rarely 5-lobed. Corolla cylindric-urnshaped, 4-toothed or -lobed. Stamens 8. Anthers opening by a terminal pore or chink. Style filiform; stigma 4-lobed. Capsule ovoid, woody, 4-celled, 4-valved, many-seeded. Seeds slender.—Species 7, North America and Asia. (Archibald Menzies, surgeon and botanist of the Vancouver Expedition.)

1. **M. ferruginea** Sm. Mock Azalea. (Fig. 283.) Slender shrub 6 to 15 feet high; leaf-blades thin, obovate, acutish, serrulate, 1 to 3 inches long, glandular-mucronate at apex, thinly strigose above, the midrib below provided with a few scarious subulate flattened hairs; petioles 1 line long; pedicels glandular-pubescent, 10 to 13 lines long; calyx very shallowly and obtusely 4-lobed; corolla yellowish-green with pink lobes, 3 to 4 lines long; capsules $3\frac{1}{2}$ lines long, on erect pedicels.

Shady woods, 100 to 1000 feet: near the coast in Humboldt and Del Norte Cos. North to Alaska. June.

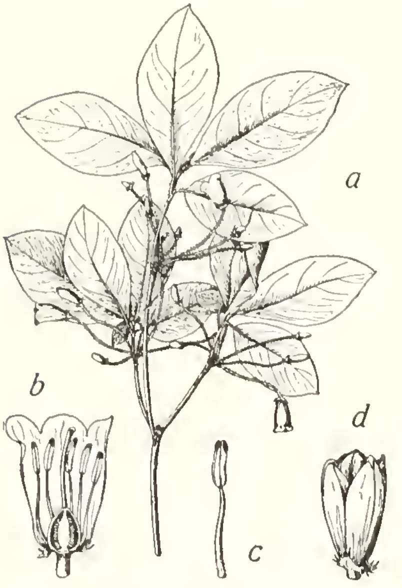

Fig. 283. Menziesia ferruginea Sm. *a*, flowering branchlet, × ½; *b*, long. sect. of fl., × 2; *c*, stamen, × 3; *d*, capsule, × 2.

Locs.—Humboldt Co.: Freshwater Creek, *Tracy* 2676; Prairie Creek (head of), *Tracy* 3110; Russ Grove, *E. Fritz.* Del Norte Co.: Graves Grove, *E. Fritz.*

Refs.—MENZIESIA FERRUGINEA Sm., Ic. Pl. Ined. t. 56 (1791), type loc. "in Americae borealis tractu occidentali," *Menzies;* Jepson, Man. 742 (1925).

4. **KALMIA** L. American Laurel

Ours low subalpine or diminutive alpine shrubs with glabrous herbage. Leaves opposite, coriaceous, evergreen. Flowers in umbels terminating the branches. Calyx deeply 5-parted. Corolla saucer-shaped, 5-lobed, with 10 pouches below the lobes and sinuses. Stamens 10, each pouch of the corolla holding an anther. Ovary 5-celled, the placentae borne at the summit of the cells. Capsule septicidally 5-

valved from above.—The expansion of the corolla curves the filaments outward and backward, so that irritation or jostling of the stamens or corolla, as by an insect, causes the elastic filaments to release the anthers with considerable violence, thus scattering the pollen.—Species 6, North America. (Peter Kalm, early North American explorer, Knight of the Order of Vasa and a pupil of Linnaeus.)

1. **K. polifolia** Wang. SWAMP LAUREL. (Fig. 284.) Erect, 1 to 2 feet high; leaf-blades elliptic-oblong to oblong, shining green above, glaucous or whitish beneath, entire, revolute-margined, ½ to 1 inch long; sepals ovate; corolla bright pink or rose-purple, 6 to 9 lines broad; valves of the capsule pouch-shaped, splitting halfway down the back but closed in front below, the opening above corresponding to a placenta; placentae persisting on the summit of the axis.

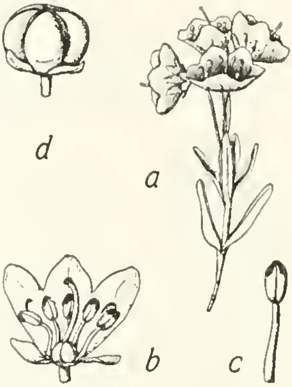

Fig. 284. KALMIA POLIFOLIA Wang. *a*, fl. branchlet, × ½; *b*, long. sect. of fl., × 2; *c*, stamen, × 4; *d*, capsule, × 2.

Wet meadows or bogs, 3500 to 8000 feet: Humboldt and Siskiyou Cos.; Sierra Nevada from Eldorado Co. to Modoc Co. North to Alaska, east to Newfoundland. June-July.

Locs.—North Coast Ranges: Bald Mt., Humboldt Co., *Tracy* 7177; Trinity Summit, *Tracy* 14,261; Jackson Lake, Siskiyou Co., *Alexander & Kellogg* 146. Sierra Nevada: Fallen Leaf Lake, *M. S. Baker;* Squaw Valley, Placer Co., *L. S. Smith* 1591; Frog Lake, Castle Peak, Nevada Co., *Sonne;* Lassen Creek, Warner Mts., Modoc Co., *L. S. Smith* 908.

Var. **microphylla** Rehd. ALPINE LAUREL. Two to 3 inches high; leaves often seemingly linear on account of the strongly revolute edges, 3 to 7 lines long; corolla 5 to 7 lines broad.—Wet meadows or swamps, 7,000 to 12,000 feet: Sierra Nevada from Tulare Co. to Shasta Co.; north to British Columbia, east to Colorado.

Locs.—Twin Lakes, Tulare Co., *W. Fry* 371; Evolution Basin, Fresno Co., *E. Ferguson* 475; Nellie Lake, Fresno Co., *A. L. Grant;* Vogelsang Pass, Yosemite, *Jepson* 3227; Bloody Cañon, Mono Co., *Jepson* 4460; Tilden Lake, Tuolumne Co., *Jepson;* Suzy Lake, Eldorado Co., *Ottley* 1148; Lassen Peak, *J. Grinnell.*

Refs.—KALMIA POLIFOLIA Wang., Beob. Ges. Naturf. Freunde Berlin 2^2:130 (1788), type loc. Newfoundland; Jepson, Fl. W. Mid. Cal. ed. 2, 313 (1911), Man. 742 (1925). *Kalmia glauca* Ait., Hort. Kew. ed. 2, 3:47 (1811). Var. MICROPHYLLA Rehd.; Bailey, Cyclop. Am. Hort. 2:854 (1900); Jepson, Man. 742, fig. 725 (1925). *Kalmia glauca* var. *microphylla* Hook., Fl. Bor. Am. 2:41 (1834), type loc. Rocky Mts., *Drummond.*

5. **PHYLLODOCE** Maxim.

Diminutive alpine heath-like shrubs. Leaves evergreen, alternate, crowded, linear, with revolute margins, articulated with the stem and leaving behind a raised scar when falling away. Flowers in ours rose-color, racemose-crowded at the summit of the branches and therefore appearing umbellate. Pedicels glandular, each with 2 bracts at base. Calyx of 5 (rarely 4) sepals. Corolla open-campanulate, 5-lobed. Stamens 7 to 10; anthers opening by an oblique terminal chink. Capsule globose, septicidally 5-valved from the summit.—Species 7, North America, Europe and Asia. (Greek phullodoce, a sea nymph mentioned by Virgil.)

Stamens exserted; corolla 5-cleft to the middle...1. *P. breweri.*
Stamens included; corolla merely 5-lobed...2. *P. empetriformis.*

1. **P. breweri** Hel. HIKERS HEATHER. Stems rigid, 4 to 12 inches high; leaf-blades entire or obscurely serrulate, 3 to 7 lines long; sepals mostly glabrous; corolla deeply saucer-shaped or bowl-shaped, 4 to 6 lines broad, 5-cleft nearly or quite to the middle, the lobes recurving from the tip; style exserted.

Alpine rocky slopes, 4000 to 12,000 feet: Sierra Nevada from Shasta Co. to Tulare Co.; San Bernardino Mts. July-Aug.

Geog. note.—Phyllodoce breweri is a characteristic alpine species of the Sierra Nevada and is quite confined to this range save for a few stations in the San Bernardino Mts. While present on Lassen Peak it does not occur on Mt. Shasta nor in the high montane country of Trinity Co. or western Siskiyou Co. In these various northern areas it is replaced by Phyllodoce empetriformis. The ranges of these two allied species are, therefore, mutually exclusive.

Locs.—Sierra Nevada: Sugar Pine Flat, Viola road, se. Shasta Co., *J. Grinnell;* Lassen Peak, *Jepson* 15,317; Brokeoff Mt., Tehama Co., *J. Grinnell;* Castle Peak, Nevada Co., *Sonne;* Grass Lake, above Fallen Leaf, *Ottley* 806; Soda Springs Cañon above Kennedy Lake, Tuolumne Co., *A. L. Grant* 490; Vogelsang Pass, above Yosemite, *Jepson* 3228; Chiquito Lake, Madera Co., *Kennedy;* Nellie Lake, Fresno Co., *A. L. Grant* 1413; Evolution Creek, Fresno Co., *E. Ferguson* 463; Bullfrog Lake near Kearsarge Pass, *Jepson* 839; Twin Lakes, Tulare Co., *W. Fry* 413; Mt. Whitney, *K. D. Jones.* San Bernardino Mts.: San Gorgonio Peak, *Munz* 6202; Dollar Lake, *Munz* 12,648.

Refs.—PHYLLODOCE BREWERI Hel., Muhl. 1:1 (1900); Jepson, Man. 742 (1925). *Bryanthus breweri* Gray, Proc. Am. Acad. 7:367 (1868), type loc. Woods Peak, Eldorado Co., *Brewer;* Jepson, Fl. W. Mid. Cal. ed. 2, 311 (1911).

2. **P. empetriformis** D. Don. CASCADE HEATHER. Dense cushion-like bush ¾ to 2 feet high; leaf-blades microscopically serrulate, often obscurely so, 2½ to 6 lines long; sepals mostly ciliolate; corolla campanulate, 2 to 3 lines long, the lobes much shorter than the tube; style included or exserted.

High montane slopes, 6200 to 9000 feet: Trinity and Siskiyou Cos. North through the Cascade Mts. to Alaska, east to Wyoming. June-July.

Locs.—Rock Lake, ridge betw. New River and Salmon River, *J. P. Tracy* 14,406; Devils Cañon Mts., head of New River, *Frank Graham;* Grizzly Creek, Trinity Co., *Alexander & Kellogg* 263; Castle Lake, Trinity Mts., *Condit;* Cuddihy Valley (ridge above), w. Siskiyou Co., *Jepson* 2850; Shackelford Creek (head of), *Butler* 1686; Mt. Shasta, *Congdon.*

Refs.—PHYLLODOCE EMPETRIFORMIS D. Don, Edinb. New Phil. Jour. 17:160 (1834); Jepson, Man. 743 (1925). *Menziesia empetriformis* Sm., Trans. Linn. Soc. 10:380 (1811), type loc. "west coast of North America", *Menzies. Bryanthus empetriformis* Gray, Proc. Am. Acad. 7:367 (1868); Jepson, Fl. W. Mid. Cal. ed. 2, 312 (1911).

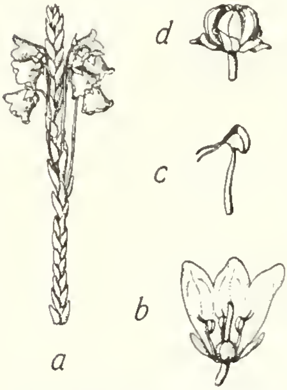

Fig. 285. CASSIOPE MERTENSIANA G. Don. *a*, fl. branchlet, × ¾; *b*, long. sect. of fl., × 2; *c*, stamen, × 6; *d*, capsule, × 2½.

6. CASSIOPE D. Don

Diminutive alpine shrubs with heath-like stems. Leaves evergreen, opposite (in ours), densely imbricated, small, entire. Flowers solitary, nodding on slender naked peduncles. Calyx of 4 or 5 ovate sepals. Corolla broadly campanulate, in ours 5-lobed. Stamens 10 or 8; filaments subulate; anthers tipped with a pair of recurved awns. Capsule globose, 4 or 5-celled, loculicidal, the valves soon 2-cleft.—Species 7, North America, Europe and Asia. (Cassiope, wife of Cepheus and mother of Andromeda.)

1. **C. mertensiana** G. Don. LOVE HEATHER. (Figs. 285 and 286.) Tufted, 2 to 12 inches high, the stems covered throughout with thick fragrant leaves crowded in 4 ranks; leaves ovate, keeled on the back, 1 to 2 lines long; peduncles lateral; corolla white or rose-color, 3 lines long.

Rocky ridges and slopes: Sierra Nevada, 7500 to 11,800 feet, from Tulare Co. to Shasta Co.; Trinity Co. to western Siskiyou Co., 6800 to 7500 feet. North to Alaska, east to Wyoming. July-Aug.

Field note.—Cassiope mertensiana, an alpine species, develops massy colonies along rifts in granite rocks, or it may, often, form a thin ground cover over extensive less broken areas. It is one of the more common alpines in the Sierra Nevada. Reaching an altitude of 11,800 feet near Muir Pass (*Peirson*), it is found as low as 7500 feet in the Lake Tahoe region. While known from Lassen Peak, it has not been recorded from and probably does not occur on Mt. Shasta, but inhabits several high Coast Range peaks westward.

Locs.—Sierra Nevada: Mt. Brewer, *Brewer* 2805; Muir Pass, *Leonard;* Evolution Creek, Fresno Co., *E. Ferguson* 466; Lake of the Lone Indian, Fresno Co., *A. L. Grant* 1541; Mt. Lyell,

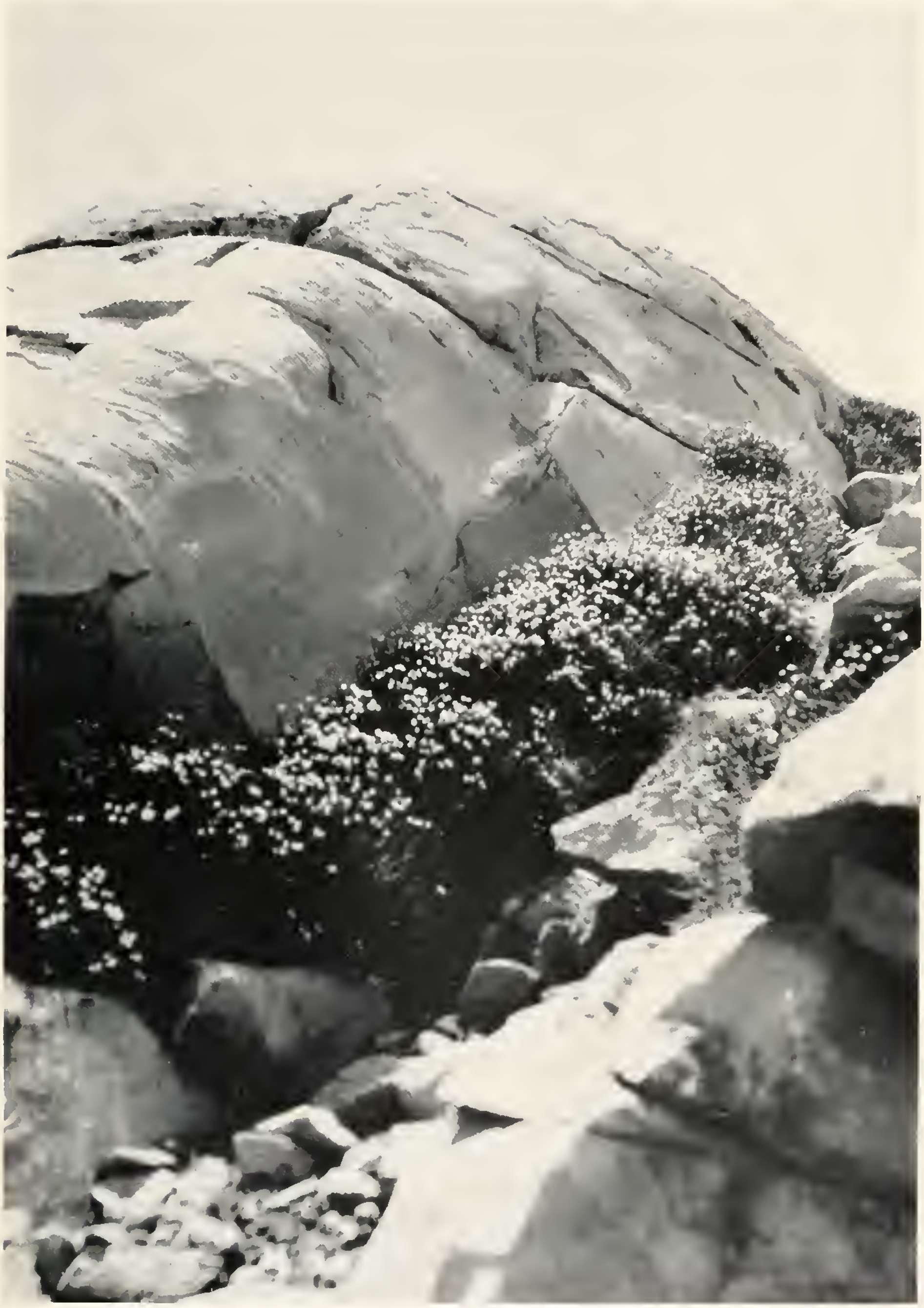

Fig. 286. Cassiope mertensiana G. Don. Colony in a rift on the slope of a granite ridge, south side of Garnet Lake near Banner Peak, Madera Co., Sierra Nevada, 8800 feet. Photo. Inez Mexia, Aug. 1, 1921.

Jepson 3343; Lake Smedberg, Tuolumne Co., *Jepson* 4505; Suzy Lake near Fallen Leaf, *Ottley* 1142b; Mt. Anderson, Placer Co., *Sonne;* Kneeland Mill, Nevada Co., *Sonne;* Lassen Peak (Bot. Cal. 1:456). Trinity and Siskiyou Cos.: Whites Creek (head of), Devils Cañon Mts., Trinity Co., *Tracy* 14,611; Thompson Peak, *Alexander & Kellogg;* Mt. Eddy, *Copeland* 3898.

Refs.—CASSIOPE MERTENSIANA G. Don, Hist. Dichl. Pl. 3:829 (1834); Jepson, Fl. W. Mid. Cal. ed. 2, 311 (1911), Man. 743, fig. 726 (1925). *Andromeda mertensiana* Bong., Mem. Acad. St. Petersb. ser. 6, 2:152, t. 5 (1832), type loc. Sitka, Alas., *Mertens.*

7. LEUCOTHOE Don

Shrubs with coriaceous alternate leaves. Flowers white, in terminal or subterminal racemes, thus forming a naked panicle. Bracts and bractlets in ours small, scarious or whitish. Calyx of 5 sepals. Corolla ovate, with a narrow opening. Stamens 10; anthers oblong, obtuse, awnless but with each cell 2-mucronate. Ovary 5-celled; stigma 5-lobed. Capsule somewhat depressed, loculicidal; placentae borne on the upper part of the central axis or columella.—Species 30, North and South America and Asia. (Leucothoe, daughter of Orchamur, King of Babylon, and Eurynome.)

1. **L. davisiae** Torr. SIERRA LAUREL. (Fig. 287.) Erect evergreen shrub 2 to 6 feet high; leaf-blades oblong, obscurely serrulate or entire, 1 to 3 inches long; racemes erect, 2 to 4 inches long; flowers pendulous, 3 to 3½ lines long; capsule depressed-globose, shallowly 5-lobed, 2 to 2¼ lines wide.

Springy ground in the mountains, 6000 to 8000 feet: Sierra Nevada from Madera Co. to Butte Co.; Trinity and Siskiyou Cos. July. The foliage is extremely poisonous to sheep.

Locs.—Sierra Nevada: Whiskey Ridge, Madera Co., *K. Brandegee;* Poison Mdw., 5 mi. from Kelty Mdw., Madera Co., *Kennedy;* Signal Peak, Mariposa Co., *Congdon;* Mutton Creek, Eldorado Co., acc. *P. G. Haddock;* Frog Lake, Castle Peak, Nevada Co., *Sonne:* Scales Diggings, near Poverty Flat, Sierra Co., *C. B. Bradley;* Bucks Ranch, Plumas Co., *O. M. Evans;* Brush Creek, Butte Co., *Conger.* North Coast Ranges: Grizzly Creek, Trinity Co., *Alexander & Kellogg* 283; Whiskey Butte, w. Siskiyou Co., *J. P. Young.*

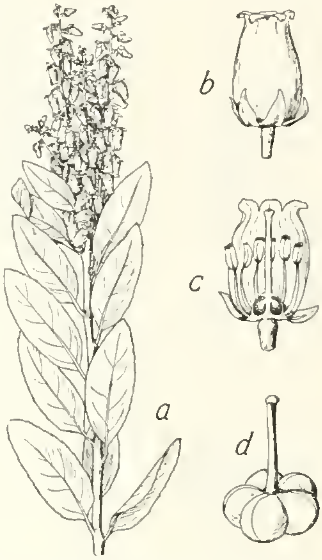

Fig. 287. LEUCOTHOE DAVISIAE Torr. *a*, flowering branch, × ⅓; *b*, fl., × 2½; *c*, long. sect. of fl., × 2½; *d*, capsule, × 2½.

Refs.—LEUCOTHOE DAVISIAE Torr.; Gray, Proc. Am. Acad. 7:400 (1868), type loc. Nevada Co., *Nancy J. Davis;* Jepson, Fl. W. Mid. Cal. ed. 2, 311 (1911), Man. 743 (1925). *Oreocallis davisiae* Small, N. Am. Fl. 29:58 (1914).

8. GAULTHERIA L.

Evergreen shrubs or fruticulose plants. Leaves alternate, broad, shining above. Flowers white or pink. Calyx 5-cleft. Corolla 5-toothed or -lobed. Stamens 10; filaments dilated at base. Ovary depressed, 5-lobed, 5-celled, seated on a thin narrow undulate-toothed disk; placentae horizontal; stigma entire or obscurely 5-lobed. Calyx becoming fleshy and at length enclosing the pod, forming a globose berry-like fruit.—Species about 100, North and South America, Asia and Australia. (Dr. Gaultier, Canadian physician and botanist.)

Flowers in racemes; filaments hairy on back; anthers with a pair of spreading awns from the summit of each cell; berries blue-black, 4 to 6 lines long……1. *G. shallon.*
Flowers solitary in the axils; filaments glabrous; anthers not awned; berries scarlet, about 3 lines long.
  Calyx glabrous; leaf-blades oval; stems glabrous, sometimes puberulent or hairy……2. *G. humifusa.*
  Calyx hairy; leaf-blades ovate; stems and petioles hairy……3. *G. ovatifolia.*

1. **G. shallon** Pursh. SALAL. (Fig. 288.) Slender shrub with erect or spreading stems 1 to 6 feet high; leaf-blades ovate or orbicular, slightly cordate at base, finely serrate, 2 to 4 inches long; petioles 1 to 2 lines long; racemes axillary or terminal, 3 to 6 inches long, pubescent (as also calyx and corolla) with short glandular hairs; bracts of raceme scaly, ovate, concave, often reddish; pedicels declined, bearing 2 bractlets below the middle; calyx reddish; corolla white or pinkish, oval-urn-shaped, 5-toothed at the narrow orifice, 4 to 5 lines long; awns of anthers bifid.

Woods along the coast, especially in the Redwood belt, 50 to 2500 feet: Santa Barbara Co. to Del Norte Co. North to British Columbia. Mar.-May.

Field note.—Gaultheria shallon is one of the most characteristic of forest floor shrubs in the Redwood belt. Often it is a dominant and, sprouting from the root-crown, forms dense thickets 4 to 6 feet high. It is also found on open slopes near the ocean, as on the Wildcat grade above Ferndale, forming with Pteris aquilina, Rubus parviflorus and Epilobium angustifolium extremely dense thickets. Such a hillside growth with smooth even surface may seem, at a few yards distance, only a foot high, but the traveler entering it sinks down to his shoulders or even disappears from view. On the Point Reyes peninsula where fire destroys the Bishop Pine (Pinus muricata) or the chaparral, Gaultheria shallon, Vaccinium ovatum, Ceanothus thyrsiflorus, Castanopsis chrysophylla var. minor and Pteris aquilina establish the first successional cover.

Locs.—Santa Inez Mts. (Syn. Fl. 2:30); Cerro Alto Mt., San Luis Obispo Co., *Condit & Waters;* betw. Lucia and Mill Creek, Santa Lucia Mts., *Jepson;* Monterey, *Eloise Fife;* Mill Valley, Mt. Tamalpais, *Jepson* 14,658; Cahto, Mendocino Co., *Jepson* 14,656; Bull Creek, Humboldt Co., *Jepson* 16,470; Redwood Creek at Berry's ranch, *Jepson* 1952; Wilson Creek, s. Del Norte Co., *Jepson.*

Refs.—GAULTHERIA SHALLON Pursh, Fl. 283 (1814), type loc. Columbia River, *Lewis;* Jepson, Fl. W. Mid. Cal. 373 (1901), ed. 2, 314 (1911), Man. 743, fig. 727 (1925).

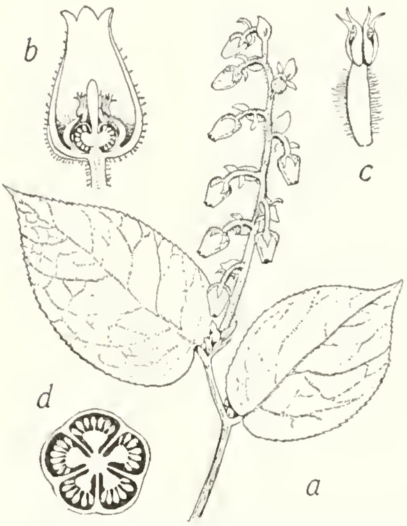

Fig. 288. GAULTHERIA SHALLON Pursh. *a*, fl. branchlet, × ⅓; *b*, long. sect. of fl., × 2; *c*, stamen, × 4½; *d*, cross sect. of ovary, × 4.

2. **G. humifusa** Rydb. ALPINE WINTERGREEN. Stems procumbent, 2 to 8 inches long, forming a loose mat; herbage glabrous or the stems occasionally a little pilose or puberulent; leaf-blades orbicular or oval, obscurely or finely crenulate or serrulate or subentire, often setulose-serrulate towards apex, 3 to 7 lines long; petioles ¼ to ½ line long; flowers solitary and axillary, 1½ to 2 lines long, the pedicels ½ line long with 3 to 5 bractlets; calyx glabrous; corolla white, depressed-campanulate, 5-parted, scarcely exceeding the calyx; anthers not awned, obscurely 4-pointed at apex.

Moist slopes or wet meadows, 8000 to 9000 feet: Sierra Nevada in Fresno Co. Rare in California. North to British Columbia and Alberta, east to Colorado. July.

Locs.—Granite Basin, Kings River, *Clemens;* Grouse Mdw., LeConte Cañon, *Peirson* 2530.

Refs.—GAULTHERIA HUMIFUSA Rydb., Mem. N. Y. Bot. Gard. 1:300 (1900); Jepson, Man. 744 (1925), as to Sierra Nevada plants; Abrams, Madroño 2:121 (1934). *Vaccinium humifusum* Graham, Edinb. New Phil. Jour. 193 (1831), type a garden plant, the seed from the Rocky Mts., *Drummond. G. myrsinites* Hook., Fl. Bor. Am. 2:35, t. 129 (1834).

3. **G. ovatifolia** Gray. OREGON WINTERGREEN. Stems 4 to 7 inches long, ascending from long running rootstocks; petioles and stems pilose with rusty hairs; leaf-blades ovate, acute at apex, rounded or subcordate at base, glabrous or nearly so, ½ to 1½ inches long; flowers solitary in the axils, 1½ to 2 lines long, the pedi-

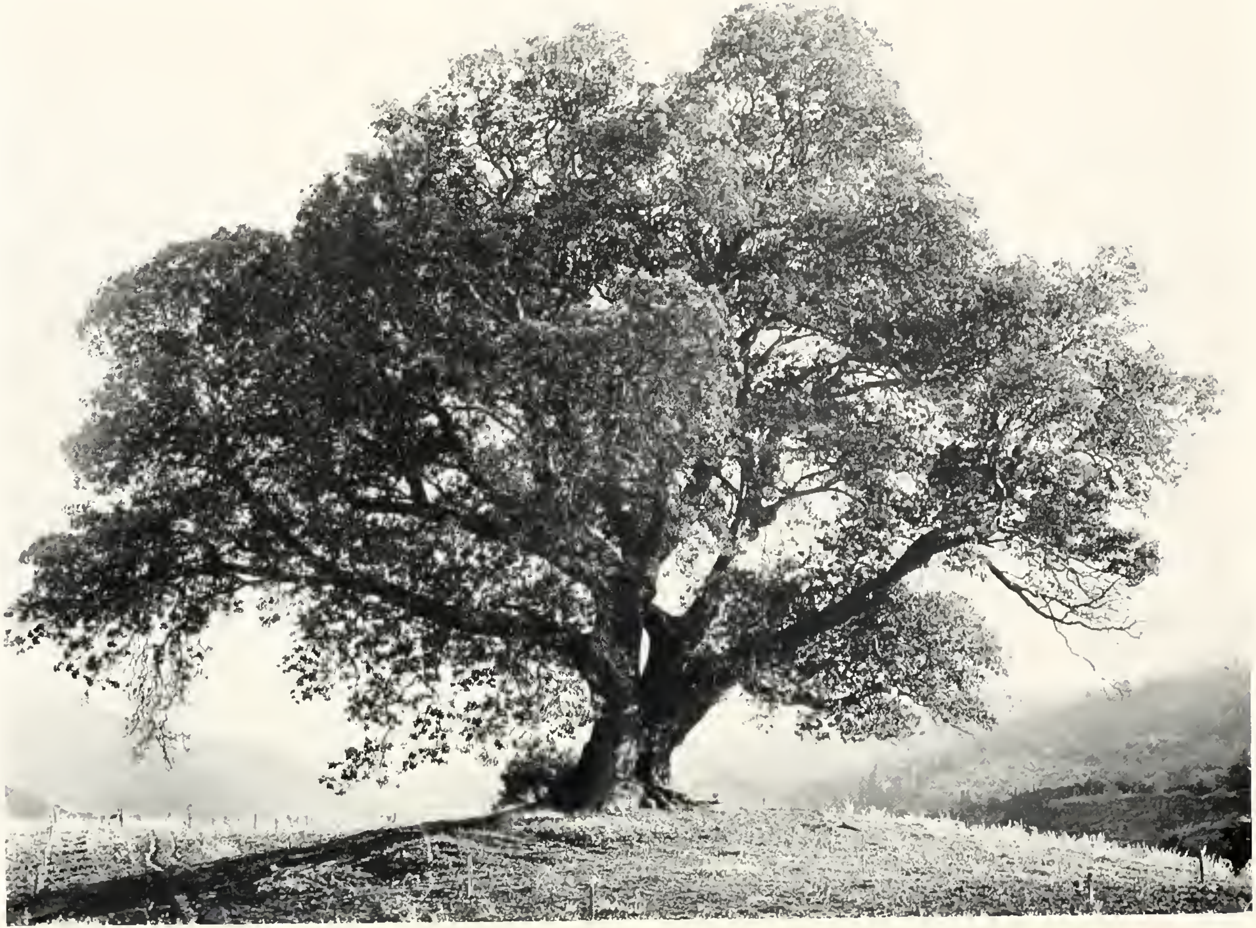

Fig. 289. ARBUTUS MENZIESII Pursh. Broad-headed type of tree. This individual is the Theobald Madroño. It stands in the Santa Cruz Mountains one mile west of the village of Alma; circumference of trunk at 3 feet above ground (smallest part), 25 feet, 3 inches; diameter of crown, 95 feet; height, 90 feet. Photo. Frank Kettlewell, 1938; measurements by W. S. Morley.

cels nearly as long, bearing 4 to 6 bractlets; calyx hairy, its lobes ovate, very acute, longer than the tube; corolla campanulate, shallowly lobed, 1½ to 2 times as long as the calyx; anthers not awned.

Wet or boggy spots on wooded slopes, along small streams, or in cañons, 3000 to 4800 feet: North Coast Ranges from Humboldt Co. to Siskiyou and Del Norte Cos.; Sierra Nevada in Eldorado Co. North to British Columbia and Idaho. June.

Locs.—North Coast Ranges: Horse Mt., Humboldt Co., *Tracy* 7670; Camp Six, Smith River, *M. S. Baker* 245; Onion Patch on Kelsey Trail, w. Siskiyou Mts., *Jepson* 2878; Camp Six, Del Norte Co., *R. Van Deventer* 158; Sisson, *Lemmon.* Eldorado Co.: Blodgett Forest, 14 mi. e. of Georgetown, *P. H. Haddock.*

Refs.—GAULTHERIA OVATIFOLIA Gray, Proc. Am. Acad. 19:85 (1883), type loc. Cascade Mts., *Lyall;* Piper, Contrib. U. S. Nat. Herb. 11:441 (1906); Abrams, Madroño 2:122 (1934).

9. **ARBUTUS** L. ARBUTE TREE

Evergreen trees or shrubs with glossy leathery alternate leaves. Flowers in a terminal panicle of dense racemes. Calyx small, 5-parted. Corolla globular or ovate, 5-lobed at apex. Stamens twice as many as the corolla-lobes, included; filaments soft-hairy; anthers with a pair of reflexed awns on the back. Ovary on a hypogynous disk, 5 or rarely 4-celled. Fruit a many-seeded berry with granular surface.—Species about 14, North America, Europe and Asia. (Latin name of the Arbute tree under which, says Horace, idle men delight to lie.)

1. **A. menziesii** Pursh. MADROÑO. (Fig. 289.) Widely branching tree 20 to 125 feet high; bark polished, crimson or terra-cotta, or on old trunks dark brown and fissured into small scales; leaf-blades narrowly elliptic or ovatish, glabrous, dark green and polished above, glaucous beneath, entire, or on vigorous shoots finely serrate, 3 to 6 inches long; petioles ½ to 1 inch long; flowers white; corolla 3 lines long, with 5 very small lobes recurving from the small opening, and 10 semitransparent glands in a circle at base; berry somewhat depressed-globose, 4 to 5 lines in diameter, fleshy but rather dry, red or orange color.

Rich slopes and ridges in the foothills and mountains, 300 to 4000 feet: Lower California (rare); coastal Southern California (the stations few and scattered); Coast Ranges from San Luis Obispo Co. to Del Norte Co.; Sierra Nevada from Mariposa Co. to Shasta Co. North to British Columbia. Apr.-May.

Field note.—In Southern California, in the South Coast Ranges outside of the Redwood belt, and in the inner North Coast Range Arbutus menziesii is an uncommon or rare tree, as also generally in the Sierra Nevada. In the Redwood belt, associated with Sequoia sempervirens, it is abundant. It is even more abundant in the Redwood border forest composed of Quercus garryana, Pseudotsuga taxifolia and Lithocarpus densiflora (Pasania densiflora). With the two latter species it is commonly in active competition, but is always pushed to one side in the struggle for light, so that Madroño trees are slender and the trunks nearly always curving or contorted, the crown eventually occupying but a very small area in the forest canopy. Long curving forms of trunks 30 to 60 feet long are no uncommon spectacle in the forest. On account of this leaning character the diameter of the trunk is always greater in one direction, and in extreme cases the trunk is much flattened. The base of the trunk, too, is often strongly buttressed or tends to develop a broad tabulation at the ground. Since the Madroño suffers severely from forest fires, a tree with a hollowed trunk finally falls, regeneration shoots develop from the expanded base and eventually a circle of trees surrounds the old site. Many such circles diversify the Mendocino and Humboldt woods. A circle of this kind may be destroyed by fire, whereupon a second circle arises more or less outside the first circle. Evidence of regeneration after fire is everywhere apparent throughout the range of the species in California. F. W. Peirson, a field student in Southern California, writes: "The marked belt of Arbutus menziesii across the south slope of the San Gabriel Range is second growth; at some time in the past it must have formed a splendid strip of forest; the bases or relic butts of the former trees are everywhere apparent. Choosing the largest butt that could be found, it measured eight feet in diameter."

The center of distribution of this species is in Humboldt and Mendocino counties. Here it reaches greatest size and greatest density and shows strongest reproductive capacity. In the more open woodlands of the inner margins of the Redwood belt in this region the Madroño develops into symmetrical trees of great beauty, 60 to 110 feet high with trunk diameters reaching

2 to 4 feet, or at the ground 5 to 6 feet. A remarkable tree is the Council Madroño, which stands on the southerly slopes of the Wilder Ridge near Ettersburg in Humboldt County and was so named when first discovered by the author in 1902. A faultless individual 75 feet in height and 90 feet in crown diameter, its trunk at 16 inches above the ground was 24 feet, 1½ inches in girth as measured in 1902 (Jepson Field Book, 9:19). Ten years later Albert F. Etter reported it as 24 feet 4 inches around the trunk and with a crown circumference of 270 feet. In 1936 it measured 28½ feet in circumference at the smallest part of the trunk (Jepson Field Book, 56:191–192).

In June the vegetative shoots of the season burst forth from the terminal buds and the old leaves turn downward on their petioles and hang, usually by July 1, in a dry red tuft beneath the new foliage. These old leaves fall in July and August. In midsummer too, the handsome red-brown bark begins to exfoliate, revealing beneath a new base of apple green, which color soon changes into vivid terra-cotta and finally ages a burnished tawny red.

Arbutus menziesii seeds freely and readily establishes abundant seedlings. At the age of 3 to 6 years the seedlings develop a tuber-like swelling at the ground level. From this woody enlargement regeneration shoots arise after forest fires. In competition with Quercus kelloggii, as in the Hoods Peak range, the seedlings of Arbutus menziesii are sufficiently shade-tolerant to grow rapidly and at last overtop that species and kill it. The wood has been used in the manufacture of furniture and large quantities are used as charcoal by the powder companies of California. When, however, it is exposed to the elements it disintegrates rapidly under the combined attacks of fungi and wood-boring insects.

Locs.—S. Cal.: Roderick Mt., San Diego Co., *C. V. Meyer* 798; Palomar Mt., *O. H. Bailey;* Santiago Peak, Santa Ana Mts., *G. R. Hall;* Santa Anita Cañon, San Gabriel Mts., *Peirson* 140; Las Tunas Cañon, Santa Monica Mts. (Dav. & Mox., Fl. S. Cal. 271); Santa Cruz Isl., a single tree, acc. *R. Hoffmann.* South Coast Ranges: San Antonio trail, Santa Lucia Mts., *Jepson;* Valley View School, below Glenwood, *Jepson* 16,922; Waddell Creek, Santa Cruz Co., *Jepson;* Oakland Hills, *Jepson.* North Coast Ranges: Mt. Tamalpais, *Jepson;* Howell Mt., Napa Range, *Jepson* 5308; Weldon Cañon, Vaca Mts., *Jepson;* Cazadero, *Jepson;* Hawley School near Willits, *Jepson* 2409; Martin ranch, mouth of South Fork Trinity River, *Jepson* 2004; Forks of Salmon, *Jepson;* Quartz Creek, Del Norte Co., *Jepson.* Sierra Nevada: Packards Gulch, 10 mi. w. of Crockers sta., Mariposa Co., acc. *L. C. Elwell;* Colfax Sprs., acc. *Kimball Easton;* betw. Nevada City and Grass Valley; Camptonville, Sierra Co., *Jepson;* Berry Creek, Butte Co., *Jepson;* Sims sta., Shasta Co., *Jepson.* British Columbia: Departure Bay, *Jepson.*

Refs.—ARBUTUS MENZIESII Pursh, Fl. 282 (1814), type loc. "Northwest Coast," *Menzies;* Jepson, Fl. W. Mid. Cal. 372 (1901), ed. 2, 312 (1911), Silva of Cal. 272, pls. 82–83 (1910), Trees of Cal. 135, fig. 84 (1923), Man. 744, fig. 728 (1925).

10. **COMAROSTAPHYLIS** Zucc.

Evergreen shrub or small tree with alternate coriaceous leaves. Flowers white, in structure like Arctostaphylos, borne in racemes. Racemes solitary or clustered, from terminal buds. Ovary 5-celled, one ovule in each cell. Fruit red, berry-like, consisting of a solid stone densely covered with pulpy clavate or somewhat obovoid granules attached at base; stone 3 to 5-celled.—Species about 12, California and Mexico. (Greek komaros, the Arbutus, and staphule, a grape, referring to the clusters of edible fruit.)

1. **C. diversifolia** Greene. Mock Arbute. Shrub 6 to 10 feet high; bark grayish-brown, not readily exfoliating; leaf-blades oblong, serrulate, glabrous, green and shining above, white-tomentulose beneath, markedly revolute, 1 to 1¾ inches long; petioles 1 to 3 lines long; racemes 1 to 1¾ inches long; rachis, pedicels and calyx tomentose; flowers 2 to 3 lines long; calyx-lobes ovate to lanceolate, acute; corolla minutely and thinly puberulent; ovary set in a green disk, densely hairy; berry red, often tipped with the persistent style.

Dry slopes and mesas, 50 to 1500 feet: Santa Inez Mts.; Santa Monica Mts.; western San Diego Co. South to Lower California. Apr.-June.

Taxonomic note.—The appearance of this Californian species of Comarostaphylis is quite unlike that of typical Californian Arctostaphyli. The bark is grayish-brown (exfoliating tardily), while the leaves have conspicuously revolute margins and are not vertical. While the flowers are in all respects those of Arctostaphylos, even to the hairy filaments strongly dilated at base, the fruits are in no wise similar, but more resemble those of Arbutus. Comarostaphylis diversifolia, moreover, flowers in early summer, while our species of Arctostaphylos flower mostly in winter or early spring.

Locs.—Upper Mission Cañon, Santa Barbara, *Tucker* 105; Topanga Cañon, Santa Monica Mts. (Bull. N. Y. Bot. Gard. 6:431), specimens not seen but perhaps the species and not the variety; Rancho Santa Fe, *B. D. Stark* 857; San Diego, *R. W. Sumner*.

Var. **planifolia** Jepson var. n. Shrub 6 to 20 feet high; leaf-blades elliptic to ovate, plane, 1 to 3 inches long; racemes 2 to 5 inches long; pedicels 2 to 6 lines long; calyx-lobes lanceolate to subulate.—(Frutex 6–20 ped. altus; foliorum lamina elliptica vel ovata, plana, 1–3 unc. longa; racemi 2–5 unc. longi.)—Santa Rosa, Santa Cruz and Santa Catalina islands.

Locs.—Santa Rosa Isl. (Zoe 1:141); Ladys Harbor, Santa Cruz Isl., *Mabel Peirson*; Swain Cañon, Santa Catalina Isl., *Jepson* 3064 (type).

Refs.—COMAROSTAPHYLIS DIVERSIFOLIA Greene, Bull. Cal. Acad. 2:406 (1887); Jepson, Man. 744 (1925). *Arctostaphylos arguta* Zucc. var. *diversifolia* Parry, Proc. Davenp. Acad. Sci. 4:35 (1883), type loc. Jamul Valley, San Diego, *O. N. Sanford*. *A. diversifolia* Parry; Gray, Syn. Fl. ed. 2, 2:397 (1886). Var. PLANIFOLIA Jepson.

11. ARCTOSTAPHYLOS Adans. MANZANITA

Evergreen shrubs with very crooked branches, the bark dark red or chocolate-color, smooth and polished. Leaves entire (rarely serrate), more or less vertical by twisting of the petiole. Flowers white or pink, in a terminal usually subglobose nodding cluster or panicle composed of few to several short racemes. Flower parts usually in 5s. Bracts commonly scaly, sometimes foliaceous. Calyx of nearly distinct sepals. Corolla urnshaped. Stamens twice as many as the corolla-lobes; anthers with a pair of reflexed awns on the back; filaments more or less hairy, dilated toward the base. Ovary seated on a hypogynous disk, 4 to 10-celled, with one ovule in each cell, maturing into a dry brown berry-like fruit with an outer pulp covering several stony 1-seeded nutlets. Surface of the berry smooth, the pulp at first fleshy, at maturity usually mealy or powdery. Nutlets distinct, or irregularly united in 2s or 3s, or sometimes consolidated into a single stone.—The wood is hard but brash, warping and cracking excessively in seasoning. The bark of the branches during the summer exfoliates conspicuously in most species, and to some degree in all species. The trunk or main stems in Arctostaphylos tomentosa and A. nissenana have a rough shreddy bark and never become smooth. The panicles are sometimes reduced to simple racemes, regularly so in some of the smaller species. The fragile pericarp of the berries in Arctostaphylos nummularia and in A. myrtifolia is deciduous and the fruit separates into 2 to 5 nutlets (sect. Micrococcus Parry; genus Schizococcus Eastw.).—Species about 35, Pacific Coast of North America, 1 species extending east across the continent to New Jersey, north to arctic America, thence circumpolar. (Greek arktos, a bear, and staphule, a bunch of grapes; bears feed on the berries.)

Biol. note.—A well-known indicator of the Transition Zone in the Sierra Nevada is Arctostaphylos patula, a spreading green-leaved shrub commonly 3 to 5 feet high. Its main stem or stems arise from a globose woody root-crown lying at and a little below the surface of the ground. The root-crown is, in this species, a significant structure. It possesses the capacity to develop regeneration shoots after the above-ground portion of the shrub is killed by fire or removed by the axe. Such regeneration in Arctostaphylos is here spoken of as *root-crown sprouting*, a particular type of reproduction in the genus which occurs after fire; although this shrub also reproduces by layering of the lower spreading branches or by seed. Species characterized by root-crown sprouting are here spoken of as *root-crown shrubs*.

By way of contrast we turn now to the foothills. The chaparral belt of the Sierra Nevada, lying below the Transition Zone, is often dominated by Arctostaphylos viscida, or in the counties from Calaveras to Fresno, by Arctostaphylos mariposa. Both are spreading shrubs, white-leaved, 3 to 6 or 12 feet high. Under chaparral fire both these species are completely killed; the root-crown is not developed into an enlarged structure and has no capacity to send up shoots after fire or after mutilation. Seedlings are, however, produced in abundance, sometimes in astonishing profusion, and promptly repossess burned territory. Shrubs which regenerate in this manner are here called *fire-type shrubs*.

The term fire-type shrubs is here used in a restricted sense as applying to those species, the individuals of which are annihilated or completely destroyed by fire, have no means of regeneration save by seed, but have developed several biological reactions in their life history to the circumstances of exclusive reproduction by seed. While root-crown shrubs also display reaction to fire, their relation to fire is not biologically specialized to so great a degree, since the individuals are not, normally, completely killed by fire. (See introduction to Jepson, Manual of the Flowering Plants of California, 6, regarding empyroism and pyrodaptism.)

If the Coast Ranges be considered we have even more instructive illustrations of these two biological types. Arctostaphylos glandulosa is a remarkable species of the Coast Range chaparral. It has the capacity to sprout from the root-crown after fire. The writer has frequently observed (see page 28, ante) that the seedlings of Arbutus menziesii produce swellings or tubers on the root-crown in forest where there has been no fire during the life of the seedling. Arbutus is closely related to Arctostaphylos and points to the occurrence of the same phenomenon in the latter genus. In seedlings or young plants of Arctostaphylos glandulosa swellings occur similarly on the root-crown in unburned territory. No such expansion of the root-crown is observable, however, in the collected seedlings of Arctostaphylos stanfordiana, A. manzanita, A. nummularia or any of the "fire-type species," but it seems probable that tubers will be found in seedlings of all the "root-crown species." The young plants of Arctostaphylos glandulosa, it is to be noted, therefore, develop a thickened woody tuber-like body on the root-crown. In the earlier stages of the adult shrub the upper surface of such tubers or burls resembles low disks, slightly but symmetrically elevated to the center, from which abruptly arise 1 or 2 to several erect stems (Fig. 290). Under successive chaparral fires the stems are destroyed but new shoots are produced and concurrently the woody tubers develop horizontally, so that in the course of the centuries they become broad woody platforms or burls 1 to 3 feet broad, or even up to 5 or 7 feet broad. The burls bear dense masses of embryonic or potential woody buds which may produce from an area as limited as a square inch a large number of shoots (see description under Arctostaphylos glandulosa following). A pygmy forest of stems may thus arise from these platforms which become very ancient (Fig. 291). This, then, is an extreme type of a root-crown sprouting shrub. Observation of the fire-reaction habits of Arctostaphylos glandulosa have been made in many parts of the Coast Ranges, but especially on the slopes of Mt. Tamalpais overlooking the Golden Gate (Fig. 294).

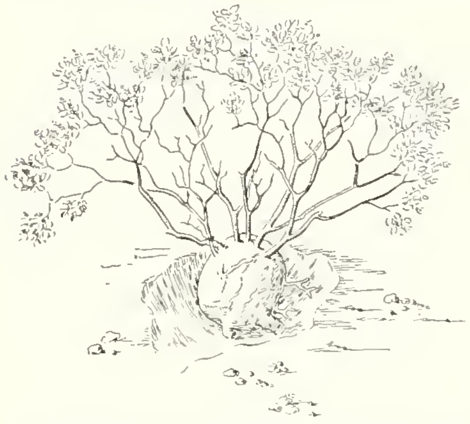

Fig. 290. Arctostaphylos glandulosa Eastw. Early stage of the formation of a woody tuber on the root-crown, with a cluster of crown-sprouts. South slopes of Mt. Tamalpais, Sept., 1913.

Associated with Arctostaphylos glandulosa on Mt. Tamalpais is another shrub of marked biological interest, Arctostaphylos nummularia. It is an erect shrub, 1 to 5 feet high, with a single trunk commonly ½ to 3 feet high before branching. This trunk joins the main root without enlargement; no woody tuber or enlargement is developed at ground level. Under chaparral fire this shrub is killed completely. On account of its shallow rooting it is especially sensitive (Fig. 292). In very intense fires the shrubs of this species may be completely consumed; in fires of less intensity the shrubs may be killed with scant injury to the plant body. Under conditions where the course of the fire is suddenly changed by the reversal or diversion of air-currents, shrubs may be killed by the high temperatures generated in their vicinity without any structural injury associated with fire. Such

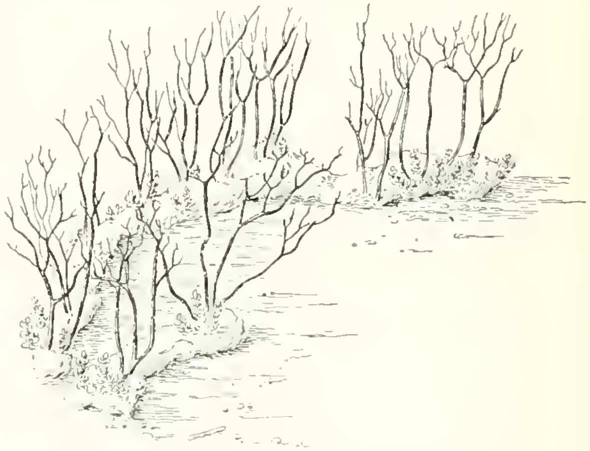

Fig. 291. Arctostaphylos glandulosa Eastw. Woody root-crown developing horizontally under the influence of fires repeated during centuries. The erect shoots are fire-killed, but subsequent to the last preceding fire new shoots are developing at their bases. South slopes of Mt. Tamalpais, Sept., 1913.

shrubs, retaining all their foliage, but with the leaves brown and dead, stand after conflagrations on the margin of fire-swept bands in the chaparral as if suddenly struck dead, without any visible sign of tissue injury to the plant as a whole (Fig. 293). The shallowness of the root system increases distinctly the chances of mortality in running fires. On Mt. Tamalpais the species tends to colonize exclusively small areas on the slopes. After fires seedlings appear promptly on burns and fruit at the age of five or six years. This species thus adapts itself to short fire intervals and is a true fire-type shrub (Fig. 295).

It is next desirable to consider the Napa Range for further illustrations of reaction of Arctostaphyli to chaparral fires. In this range Arctostaphylos manzanita is locally common. It is a shrub 5 to 8 feet high or sometimes a small tree up to 22 feet high, generally with a distinct trunk in either case. Under chaparral fires an individual of this species is killed completely. Commonly heavy crops of berries are set, and seedlings appear in large numbers on its own territory in the area of burns. These seedlings produce fruits in the juvenile stage and thus provide a safeguard against destructive fires of short time intervals. In addition seeds hibernate in the soil for long periods and provide an additional resource for a new stand. Arctostaphylos manzanita is a fire-type shrub as evidenced by the following summary: (a) the trunk develops no enlargement at the ground level; (b) the shrub is killed completely by chaparral fires and does not sprout from the root-crown; (c) it is shallow-rooted, thus increasing its sensitivity to intense chaparral fires; (d) seed production is abundant; (e) seedlings appear on burns in large numbers and tend to repossess the territory of the species; (f) seedlings fruit at an early age, often in 10 or 12 years, a period usually shorter than the interval between severely destructive chaparral fires; (g) seeds hibernate in the soil and have the capacity to develop seedlings in response to heat shock following very long hibernation periods, as shown by successive germinations of seed after short-period repetition of fire on a burn. In the Napa Range Arctostaphylos stanfordiana is often associated with Arctostaphylos manzanita and displays similar characteristics in response to destruction of individuals by fire. Both of these species are typical fire-type shrubs.

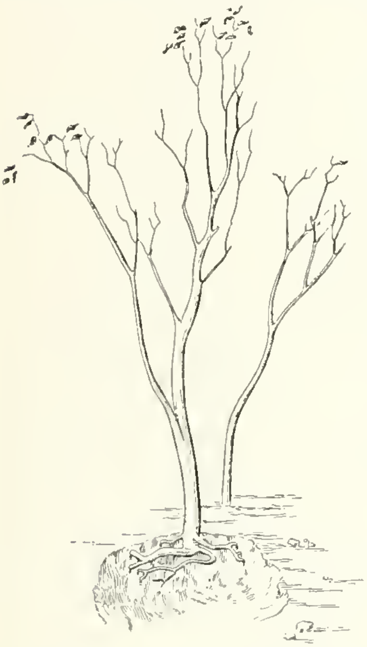

Fig. 292. Arctostaphylos nummularia Gray. Mt. Tamalpais, south slope, showing the shallow root system of a shrub.

Factual matter thus far accumulated indicates that root-crown sprouting on the one hand or fire destruction on the other characterize a given species. In other words a given species is wholly a root-crown shrub or a fire-type shrub. This fact is thus of importance in species differentiation; all the more in that reaction to fire does not run parallel to small species groups but cuts across them. It will be profitable to cite illustrations. A closely related group of species which may be noted is that of Arctostaphylos patula, A. manzanita and A. stanfordiana. It must be remembered that our species of Arctostaphylos are as a whole only slightly differentiated by definitely marked characters; distinct species, or what are believed to be such, often have very similar bark, leaves, flowers and berries. The ordinary taxonomic marks which are so commonly associated with such organs are in this genus either deficient or largely lacking. In the above group, material of one of these species may sometimes be mistaken as belonging to one of the other two. The distinction as to fire reaction between Arctostaphylos patula on the one hand and A. manzanita and A. stanfordiana on the other is, however, decisive. It is a criterion of certainty. As to distinction between Arctostaphylos manzanita and A. stanfordiana, both of which are fire-types, the situation as to sound criteria between species is saved by the fact that these two are distinguishable by many points of difference. If any one point fail, the sum total of the differentiae operate and so make clear two specific units.

A like text can be derived from consideration of another group consisting of Arctostaphylos glandulosa and A. canescens. These two species are sometimes difficult to distinguish on the basis of ordinary herbarium specimens, not in their typical form, but in view of their variables, especially when there are brought into view the variables of Arctostaphylos glandulosa. The former species is a root-crown shrub of remarkable habits and regenerates by sprouting after fire with unusual vitality; the latter is a fire-type shrub, since according to its author, Alice Eastwood, it is killed completely by fire and does not crown-sprout. It is thus evident that reaction to fire provides a species criterion of value; it is indeed of outstanding value in a group where distinctive characters of the reproductive organs or of the leaves are weakly developed or are hopelessly obscure.

Field experience with the genus Arctostaphylos began with the author as a lad during the years 1883 to 1889 in the Vaca Mountains, the southernmost block of the inner North Coast Range facing the lower Sacramento Valley. Observing the chaparral he noticed that one species made a low bush 2 or 3 feet high with several small stems arising from the ground, the stems in fact borne on a basal woody block and rightly interpreted as stump-sprouts. This species was common in the chaparral formation of the main ridge, a region fire-harried at intervals for centuries. It was, indeed, static in its area notwithstanding fire and was remarkable in that it displayed many rigid stems from an enlarged woody base which evidently developed new shoots after each successive conflagration. It was spoken of as Arctostaphylos tomentosa, a blanket name of that time, though the shrub was in reality a distinct species, A. glandulosa Eastw., a name not then published. Another species, a large shrub 5 to 8 feet high, with a single trunk at the ground, was rare in the range. The effect of chaparral fires upon it was lethal. It did not stump-sprout. This shrub passed as Arctostaphylos pungens and was later properly published as a distinct species under the name A. manzanita Parry. Reoccupation by this species, a vanishing one in the Vaca Mts., was limited, because the area lies climatically beyond the present margin of its optimum requirements.

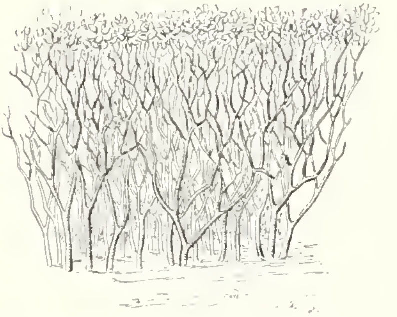

Fig. 293. ARCTOSTAPHYLOS NUMMULARIA Gray. Colony on the south slopes of Mt. Tamalpais; a cluster of shrubs on the margin of a fire band, completely killed by the intense heat but not structurally injured. Sept., 1913.

Following these juvenile experiences, systematic field work was in the course of time extended widely over California. In the region of San Francisco Bay, one admirable area, the slopes of Mt. Tamalpais, furnished a striking contrast, as to fire relations, between two Arctostaphyli, namely Arctostaphylos glandulosa (at that time passing as A. tomentosa) with its remarkable root-crown sprouts arising from a broad woody platform, and Arctostaphylos nummularia, the shrubs of which are killed completely by fire. At long intervals, after great chaparral fires on Mt. Tamalpais, the spectacular differences between these two species was used for demonstration to groups of students as an incidental part of regular field practice on vegetative and seed reproduction in a natural woody cover. Occasionally a promising student, trained to study the chaparral, was directed to watch for marked examples of reaction of native shrubs to fire. With such aid the field of observation became even more extended. Charlotte M. Hoak made pertinent observations in Mendocino County in the year 1914. F. B. Herbert and A. E. Wieslander completed in 1914 an excellent report on the woody cover of the Muir Woods watershed and confirmed reactions to fire in the case of many species. Both of these students extended their observations elsewhere up and down the state in later years. At about the same time W. C. Mathews made useful oral reports of fire reactions in the San Francisco Bay region and on the Mendocino coast. Leland S. Smith and other students developed interest in the same subject. Accumulation of evidence was slow and often involved in difficulties, but it was important, because recognition of differences in reaction to fire furnished factual matter of decisive value in the validation of necessary segregation of our species, most of which in former times passed en bloc under two names, Arctostaphylos pungens and Arctostaphylos tomentosa. Generalizations were cautiously made and observations withheld from expression because of the uncertainty of species definitions in this genus. While much valuable information has now been placed on record, even so, knowledge of the biology of our Arctostaphyli is still insufficient.

The earlier accounts of Arctostaphylos species in the literature are taxonomically formal and derived in the main if not wholly from herbarium specimens. Neither Gray, Parry, Greene, Howell nor any other author of their time mention root-crown sprouting or reaction to fire. Indeed no description of a species includes mention of this subject until the year 1916. In that year the author published an article (prepared two to three years previously) putting on record the differences in reaction to fire of various species of Arctostaphyli (Regeneration in Manzanita, Madroño 1:3–11, figs. 1–5,—1916). The textual matter was supplemented by figures illustrating response to fire, root-crown sprouting on the one hand and lethal effects of fire on the other in the case of certain species. This phase of the study of Arctostaphylos was amplified in the author's "Revision of the California Species of the genus Arctostaphylos" (Madroño 1:76–96, figs. 1–3,—1922), and was summarized in a still later paper, "The Rôle of Fire in the Chaparral," delivered before the Fifth International Botanical Congress at Cambridge, England, in 1930 (Fifth Intern. Bot. Cong. Rep. Proc. 114–116,—1931).

Determination of reaction to fire is important because, as has been shown, the species are only weakly or inconstantly separated by ordinary morphological marks. The hue of the leaves may be a valuable point and sometimes gives a better means of identification than the shape. The nature of the bark on the main trunk in certain species affords a character. The fruits are to a great degree alike but may differ in minor details, though sometimes developing an indicative

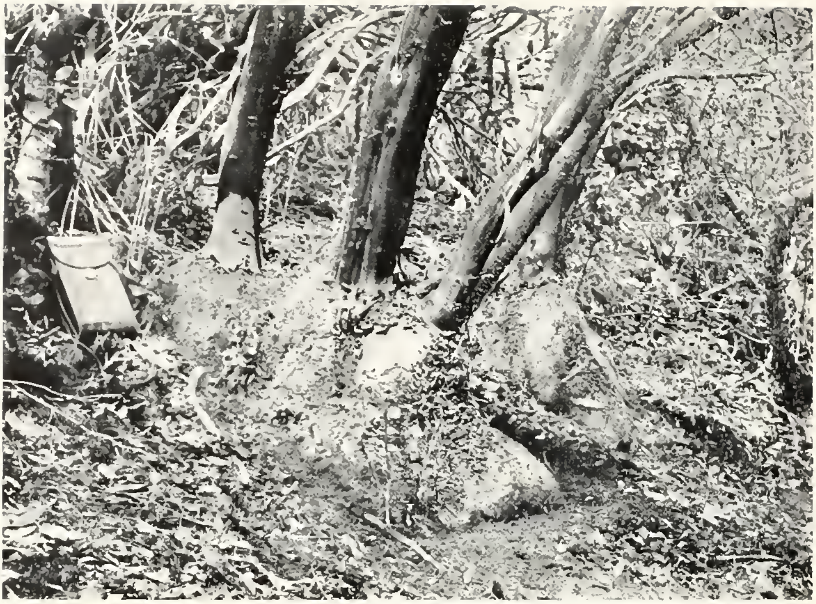

Photo. F. B. Herbert and A. E. Wieslander.

Fig. 294. Arctostaphylos glandulosa Eastw. Shrub showing the heavy tuber-like root-crown, with the erect shoots which developed from its surface after fire. South slopes of Mt. Tamalpais, Sept., 1913.

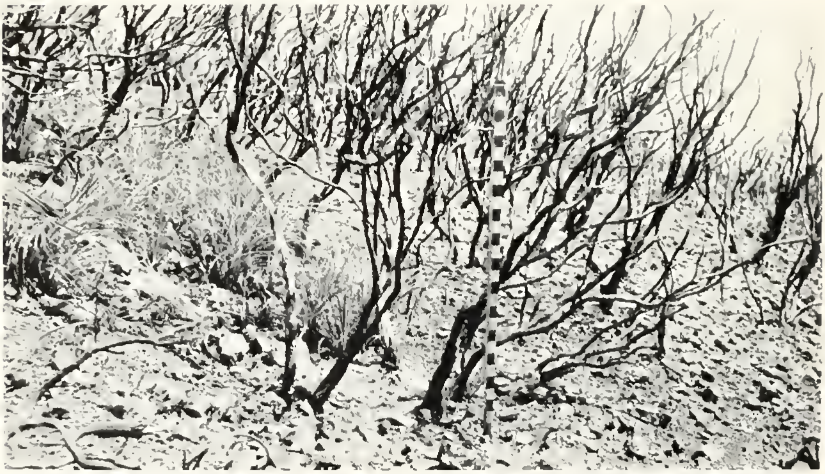

Photo. F. B. Herbert and A. E. Wieslander.

Fig. 295. Arctostaphylos nummularia Gray. Pure colony killed completely by fire and partially consumed. No crown-sprouting occurs because the root-system is fire-killed. South slopes of Mt. Tamalpais, Sept., 1913.

feature. Habit or form is frequently of marked value. As a rule it is the sum total of characters in Arctostaphylos that qualifies a species, rather than one or two constant marks.

The flower in Arctostaphylos is very uniform throughout the group, exhibiting only slight differences in the various species. Similarly the inflorescence is very uniform in structure; less commonly is it distinctive, though often exhibiting somewhat intangible or minor differences. The months from January to April cover the flowering periods of most species. The embryonic panicles are, however, developed in the preceding May to July and remain dormant for six to nine months. During the dry fall season the shrubs, therefore, bear, antecedent to the flowering panicles, structures which are peculiar. When trailing in the Napa Range in September, 1915, the author first made record in his field book of the embryonic panicles of Arctostaphylos stanfordiana which are markedly different from those of the associated Arctostaphylos manzanita: those of the former are very slender, elongated, erect, glabrous, and bear small buds; those of the latter are coarser, pendulous, puberulent and bear large buds. The embryonic panicles of Arctostaphylos elegans are different from either: they are coarse, minutely puberulent, consisting commonly of several to many simple branches, all of which, closely parallel, curve a little in one direction, that is outward or downward; the bracts are short and broad but nearly conceal the buds. In the case of Arctostaphylos viscida the panicle from August to November is extremely small, consisting of 1 or 2 very short branches with acuminate bracts which almost completely hide the buds. The embryonic panicles of Arctostaphylos canescens are stoutish, compact, curved, densely long-bracteate and white-pubescent. In Arctostaphylos glandulosa the branches of the embryonic panicles are few and curve a little; the bracts are not so congested as in Arctostaphylos canescens and tend to be suddenly contracted above the broad base which conceals the bud.

In the case of Arctostaphylos viscida the embryonic panicle is extremely small, consisting of one or two or few very short slender branches with acuminate bracts which almost completely hide the buds. The closely related Arctostaphylos mariposa exhibits similar embryonic panicles, the branches being a little stouter than in Arctostaphylos viscida and the bracts perhaps less acuminate. The slight difference in the embryonic panicles of these two species reflects the weakness of other differences or presumed differences which have been used to sustain Arctostaphylos mariposa as a distinct species. The most common species in the Sierra Nevada belt above Arctostaphylos viscida is Arctostaphylos patula. The panicle branches in this species are several, diverging a little, with the bracts distinctly spreading at right angles to the rachis as contrasted with the closely appressed bracts of both Arctostaphylos viscida and mariposa.

The above notes on the embryonic panicles began with the representation in the Napa Range, thence to Mt. Konocti in Lake County, and has been only partially extended over the state. It seems probable, nevertheless, that in all species the embryonic panicles will be found to exhibit characteristics which will be of value in either a positive or negative manner. Here is a source of character differential which could not have been predicted. Unquestionably there are other elements in the field of the life history of these species awaiting discovery.

Contributions to our knowledge of Arctostaphyli in western America have been made by a number of authors. Such contributions, diagnoses of new species and taxonomic accounts of the genus, have extended the field of knowledge, but at the same time also multiplied greatly the problems by reason of the very nature of the group and its development. It is, therefore, no reflection upon the distinguished botanists who have had to do with the publication of new species in this genus to say that an extended monograph of Arctostaphylos is now a desideratum. No revision will answer, however, which restricts itself to the usages of taxonomic formalism, to the morphological features usually depended upon in systematic botany, such as shape of leaf, color of flower and details of pubescence and glandulosity. The attack must be on the broadest possible basis and broad consideration given in the field to certain objectives, which may in part be listed, in relation to each species, as follows: (a) study of habitat; (b) study of form; (c) statistical notes on range of variation in vegetative organs; (d) evaluation of glands and glandular development and degree of variation; (e) kinds and character of trichomes, their variation and their degree of persistence; (f) reproductive organs; (g) extent of interbreeding under natural conditions; (h) seed production, character of seedlings and of reproduction in the juvenile stage; (i) development of root-crowns and burls; (j) reaction to chaparral fires; (k) seed hibernation and seed longevity under natural conditions; (l) associated species; (m) centers of distribution; (n) degree of constancy throughout range; (o) study of minor forms; (p) climatic factors; (q) relation of a given type or form to minor climatic areas; (r) correlation of distribution with chemical characters of soils or with a definite degree of soil acidity; (s) relation of the species or minor forms to fault blocks large and small and their geological history; (t) the organism as a whole and the discovery of as yet unknown constants or factors which in all probability exist. It is peculiarly true in Arctostaphylos that no tests can be applied in this genus for the species as a whole, but that each species must be worked out on its own basis as to the significant criteria for that species.

The problem of Arctostaphylos in the Coast Ranges is very unlike that in the Sierra Nevada. In the Sierra Nevada the species are fewer and are, on the whole, relatively constant throughout the length of that mountain chain. There are only two narrow endemics in the Sierra Nevada: one, Arctostaphylos nissenana in the Eldorado County foothills, the other, A. myrtifolia in the Amador County foothills. In the Coast Ranges, on the contrary, there are not only a larger number of species, but a very large number of minor forms of restricted habitat, perhaps as many as eighty, which minor forms without doubt are more or less clearly associated with minor climatic areas and also have a relation to fault blocks and the geological history of the region. These minor forms cannot be ignored, but the problem of associating them in specific units calls for extended and close knowledge subject to searching and critical analyses of field materials, cultural studies and results.

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A. Dwarf or procumbent or low shrubs ½ to 2 feet high (nos. 4 and 7 sometimes up to 4 or 7 feet high); leaves small, mostly 4 to 7 (or 12) lines long; berry glabrous.

Seashore species or species near the coast line.
Ovary glabrous; pedicels glabrous or nearly so.
Leaves mostly obovate, rounded or obtuse at apex.
Leaves both sides alike; berry mostly pink or red.................1. *A. uva-ursi.*
Leaves green above, pale beneath; berry brown.................2. *A. pumila.*
Leaves ovate or obovate, shortly acute at apex, both sides alike; berry brown.................3. *A. hookeri.*
Ovary white-hairy; apex of leaves mostly short-acute.................4. *A. nummularia.*
Sierra Nevada species; ovary glabrous.
Bark smooth; leaves green.
Stems procumbent, forming a rough mat; branchlets puberulent; high Sierra Nevada and high northern ranges.................5. *A. nevadensis.*
Stems spreading, forming low shrubs ¾ to 1¼ feet high; branchlets hirsute or bristly; Amador Co. foothills.................6. *A. myrtifolia.*
Bark rough; leaves white-glaucous (at least in age); stems erect, 4 to 7 feet high; branchlets villous; Eldorado Co. foothills.................7. *A. nissenana.*

B. Erect or spreading robust shrubs mostly 4 to 10 feet high (nos. 18, 19 and 20 often 2 or 3 feet high); leaves larger, mostly 1 to 2 inches long.

1. Ovary glabrous (except in no. 17); leaves and branchlets glabrous or essentially so, at most puberulent, never hirsute or bristly (glandular-hairy in no. 17).

Pedicels not glandular or only obscurely or minutely so; berry glabrous, not glandular (except in A. elegans).
Panicles very dense; peduncles and rachises minutely glandular, not pubescent; leaves dark green; higher forest belt, chiefly Sierra Nevada.................8. *A. patula.*
Panicles more open; peduncles and rachises not glandular.
Branches disposed to be erect and straightish; peduncles and rachises glabrous or nearly so; leaves bright green, glossy.
Corolla pink; berry not glandular; North Coast Ranges, mostly the middle range, and Mt. Diablo.................9. *A. stanfordiana.*
Corolla white; berry all over glandular; Lake Co.................10. *A. elegans.*
Branches crooked, spreading widely.
Leaves obtuse or acute, more than 1 inch long.

- Peduncles and rachises canescently puberulent; panicles drooping; leaves dull green.
  - Berry with separate nutlets; North Coast Ranges and n. Sierra Nevada foothills........11. *A. manzanita.*
  - Berry with a solid stone; Tehachapi Mts. to San Gabriel Mts........12. *A. parryana.*
- Peduncles and rachises glabrous or minutely puberulent; panicles erect or only half-drooping; leaves pale or whitish; Sierra Nevada..13. *A. mewukka.*

Leaves abruptly acute, mucronate, commonly less than 1 inch long; mts. of S. Cal. and n. to Marin Co........14. *A. pungens.*

Pedicels glandular; foliage very white-glaucous.
- Berry with solid stone; pedicels viscid-glandular, sometimes glandular-pubescent; S. Cal. and South Coast Ranges........15. *A. glauca.*
- Berry with separate nutlets; pedicels glandular-hairy; branchlets and peduncles very glaucous; Sierra Nevada foothills chiefly.
  - Ovary glabrous; branchlets and peduncles glabrous and glaucous........16. *A. viscida.*
  - Ovary glandular-hairy; branchlets and peduncles glandular-hairy........17. *A. mariposa.*

2. Ovary pubescent; leaves and branchlets pubescent or usually so, often hirsute or bristly.

Leaves plane, vertical.
- Bracts herbaceous or brown.
  - Sepals entire or merely ciliate.
    - Stems several from a heavy woody basal platform; branchlets pubescent or puberulent and with spreading hairs or bristles, or merely pubescent; ovary white-hairy.
      - Main stems with smooth bark; ovary hairs glandular; berry with scattered short white hairs or glabrate, glandular or not glandular; Coast Ranges and coastal S. Cal........18. *A. glandulosa.*
      - Main stems with shreddy bark; ovary hairs not glandular; berry with scattered white hairs or glabrate, not glandular; coast line, South Coast Ranges and Santa Barbara Isls........19. *A. tomentosa.*
    - Stems single, no enlargement at ground level.
      - Leaves white-pubescent, at least when young; branchlets white-pubescent, destitute of bristles or spreading hairs; Coast Ranges and coastal S. Cal. 20. *A. canescens.*
      - Leaves green, puberulent to glabrous, rarely densely pubescent; branchlets pubescent or puberulent and commonly also with spreading hairs or bristles, usually not glandular.
        - Leaf-blades not cordate at base or rarely, petioled; berry minutely white-hairy, not glandular, or sometimes berry viscid; along the coast from Marin Co. to Del Norte Co........21. *A. columbiana.*
        - Leaf-blades mostly cordate, sessile or subsessile; berry viscid-pubescent; South Coast Ranges........22. *A. andersonii.*
  - Sepals with a glandular-fimbriate edge; berry nearly glabrous; Santa Barbara Isls........23. *A. insularis.*
- Bracts pink, petal-like; stone solid; S. Cal........24. *A. drupacea.*

Leaves strongly revolute, not vertical; stone solid; mostly S. Cal. coast........25. *A. bicolor.*

1. **A. uva-ursi** Spr. RED BEAR-BERRY. SAND-BERRY. Stems several, trailing, prostrate or buried beneath the sand (all from a single main root), giving rise to erect branching stems 4 to 6 inches high; bark dark brown or somewhat reddish, becoming roughish; leaf-blades oval or obovate, rounded at apex, rarely retuse or subacute, often reticulate-veiny, puberulent or nearly glabrous, especially in age, ½ to 1 inch long; corolla ovoid, white or pinkish, 2½ to 3 lines long; ovary glabrous; berry typically brilliant red or pink, smooth and glabrous, 3 to 4½ lines in diameter; nutlets 1 or sometimes 3-nerved on the back, obscurely roughened or reticulate on the sides.

Sand-dunes and grassy headlands along the ocean shore, 5 to 200 feet: Pt. Reyes Peninsula; Mendocino Co.; Humboldt Bay; Del Norte Co. East to New Jersey and Labrador, north to Alaska, thence around the earth in northern regions. Apr.-May.

Field note.—Arctostaphylos uva-ursi is, in our region, seldom found more than a half-mile from the ocean. Typically it is a boreal species. On sandy flats the prostrate stems often root.

Locs.—Inverness Ridge, *Ewan* 8086; Gualala, comm. *R. P. Brandt;* Point Arena, *C. F. Baker*

5258; Fort Bragg, *Mathews;* Samoa, Humboldt Co., *Davy* 6184; Lake Earl, Del Norte Co., *Ruby Van Deventer* 73. Aleutian Isls.: Iliuliuk, *Jepson* 162.

Refs.—ARCTOSTAPHYLOS UVA-URSI Spr., Syst. 2:287 (1825); Jepson, Man. 748 (1925). *Arbutus uva-ursi* L., Sp. Pl. 395 (1753), "in Europa frigida, Canada." *Uva-ursi uva-ursi* Britt.; Britt. & Brown, Ill. Fl. ed. 2, 2:693 (1913). Branchlets of plants of the California coast line vary from subglabrous to microscopically puberulent, lightly pubescent or rarely subtomentulose. Persistence of pubescence varies markedly in one narrow locality. The var. COACTILIS Fer. & Mcbr. (Rhod. 16:212,—1914) is a form in which the minute tomentum of the branchlets is persistent.

2. **A. pumila** Nutt. DUNE MANZANITA. Stems prostrate with ascending branches 4 to 8 inches high, forming somewhat coarse or rough mats 2 to 5 feet broad; branchlets and rachises puberulent; leaf-blades obovate, acutish, dull green and glabrous above, finely puberulent and pale beneath, 5 to 9 lines long; pedicels nearly glabrous; corolla 1½ lines long; ovary glabrous or nearly so; berries reddish or red-brown, globose or globose-oblong, smooth, glabrous, 2 to 3 lines in diameter; nutlets 3 to 5, rugulose on back, 1 or 3-nerved.

Sand hills and pine woods, 5 to 100 feet: shores of Monterey Bay; San Francisco. Feb.-Apr.

Locs.—Carmel, *Parish;* Monterey, *Jepson* 5702; Del Monte Heights, *F. G. Woodcock;* Seaside, *F. G. Woodcock;* San Francisco, *Kellogg & Harford* 70 (acc. H. F. Copeland in herb.).

Refs.—ARCTOSTAPHYLOS PUMILA Nutt., Trans. Am. Phil. Soc. ser. 2, 8:266 (1843), type loc. Monterey, *Nuttall;* Jepson, Man. 748 (1925). *Uva-ursi pumila* Abrams, N. Am. Fl. 29:100 (1914).

3. **A. hookeri** Don. MONTEREY MANZANITA. Low shrub, ½ to 2 feet high, or sometimes procumbent or creeping; branchlets, petioles and rachis puberulent or minutely canescent; leaves bright green, shining, thinnish, glabrous or nearly so, the blades ovate or elliptic, shortly acute, mucronate, 7 to 12 lines long; flower-clusters small; pedicels glabrous; corolla 1½ lines long; ovary glabrous; berry globose or depressed, glabrous, 2 to 2½ lines broad; nutlets distinct, small, dorsally ridged.

Small colonies in sand dunes or in open woods near the coast, 10 to 400 feet: San Francisco; hills and dunes bordering Monterey Bay from Santa Cruz to the Carmel River; San Luis Obispo coast. Mar.-Apr.

Locs.—Laurel Hill, San Francisco, *Eastwood;* Mt. Davidson, *Blasdale;* San Bruno Hills; Capitola; Pajaro Hills, *Chandler* 430; Elkhorn (hills e. of), Monterey Co., *W. S. Cooper* 27–6; Carmel, *Jepson* 2615; San Simeon, *K. Brandegee.*

Refs.—ARCTOSTAPHYLOS HOOKERI G. Don, Gen. Hist. Dichl. Plants 3:836 (1834), erroneously stated as "native of Chili," but certainly California, since citing Arctostaphylos pungens H. & A., Bot. Beech. 144, which rests on California plants collected by *Lay & Collie,* undoubtedly at Monterey; Jepson, Man. 748 (1925). *Uva-ursi hookeri* Abrams, N. Am. Fl. 29:95 (1914). *A. franciscana* Eastw., Bull. Torr. Club 32:201 (1905), type loc. Laurel Hill, San Francisco, *Eastwood.*

4. **A. nummularia** Gray. FIRE MANZANITA. (Fig. 296.) Erect shrub, 1 to 5 feet high, or diffuse or procumbent; ultimate branchlets and petioles reddish-brown, puberulent and bearing scattered spreading stiffish hairs or bristles; leaves thickly clothing the branchlets; leaf-blades orbicular to ovate or oblong, serrulate, abruptly acute or curved-apiculate, glossy above, finely reticulate-veiny beneath, glabrous or nearly so, or sparingly bristly-ciliate, 5 to 7 (or 10) lines long, on petioles ½ to 1 line long; flower parts in 4s; corolla white, 1 to 2 lines long; ovary pubescent or white-hairy; berry oblong, glabrous or nearly so, 2 lines long.

Pine barrens, or on shaly or rocky slopes in the mountains, 20 to 2500 feet: Mendocino coastal plain from Fort Bragg to Albion; Mt. Tamalpais; Santa Cruz Mts. Feb.-Mar.

Field note.—Arctostaphylos nummularia is a characteristic species of the Pinus muricata-Castanopsis chrysophylla formation of the Mendocino coastal plain. In this locality it varies in habit. Usually the stems from the root-crown are many, which is a notable feature. They are quite erect but arise from a decumbent base and bear numerous branchlets, thus forming a dense roundish or depressed low bush 1 to 3 (or 5) feet high. Sometimes, however, the stems are wholly decumbent, forming a low rough mat. The bases of decumbent stems may strike adventitious roots, but there is no capacity, as thus far observed, to develop new shoots from the root-crown after fire. As a result of fire over an area, the establishment of seedlings is stimulated. Young plants come into flower in their fourth or fifth year; Carl Purdy says they may flower in their second year. This precocity is partial evidence of the fire-type character of the species. The leaves are uniformly small. The bristles are persistent on the branchlets more than one year.

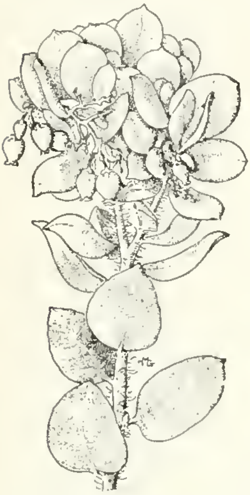

Fig. 296. ARCTOSTAPHYLOS NUMMULARIA Gray. Fl. branchlet, × ⅔.

This species also inhabits Mt. Tamalpais. Here the shrubs commonly have a single distinct trunk a few inches to 2 or 3 feet high, thus differing slightly from the prevailing Mendocino coastal plain type. Reaction to fire of the Tamalpais form was first described by the author in 1916 (Madroño 1:7) under the name A. sensitiva Jepson. The Tamalpais form is an erect shrub and is usually gregarious. There is no swelling of the trunk at the ground level. The root system is shallow, spreading horizontally just beneath the surface of the ground like an inverted umbrella. One can readily overthrow a shrub 5 feet high with a small foot-long botanical pick. The shrubs are killed completely by chaparral fires and do not sprout from the root-crown, but the "burn" promptly produces seedlings as the forerunner of a new stand. It is a genuine fire-type shrub by reason of: (a) its shallow rooting; (b) outright destruction by fire; (c) exclusive reproduction by seed; (d) immediate repossessing of an area by seedlings; (e) the early age (5 to 8 years) at which seedlings produce fruit, a period which is ordinarily shorter than the fire interval. Anthesis covers several months; sporadically one may find shrubs in flower every month in the year.

Locs.—Mendocino coast: Fort Bragg, *Mathews;* Mendocino City, *Jepson* 2166a; Albion, *Davy & Blasdale* 6068. Mt. Tamalpais: Eldridge grade, *Jepson* 14,697; Muir Ridge, w. of Mill Valley, *Jepson* 14,730; zig-zag above Blithedale, *Jepson* 9502. Santa Cruz Mts.: Butano forest, e. of Pescadero, San Mateo Co., *Bracelin;* betw. Butano and Little Butano creeks, Santa Cruz Mts., *Dudley;* Ben Lomond, *Elmer* 4899; Bonnie Doon, *Wiggins* 5093.

Refs.—ARCTOSTAPHYLOS NUMMULARIA Gray, Proc. Am. Acad. 7:366 (1868), type loc. "plains near Mendocino City," *Bolander* 4749; Jepson, Fl. W. Mid. Cal. 370 (1901), ed. 2, 313 (1911), Man. 748 (1925), the last as to Mendocino plain shrubs. *Uva-ursi nummularia* Abrams, N. Am. Fl. 29:100 (1914). *A. sensitiva* Jepson, Madroño 1:85, 94 (1922), type loc. Pipe Line trail, Mt. Tamalpais, *Jepson* 5724; Man. 748, fig. 730 (1925).

5. **A. nevadensis** Gray. PINE-MAT MANZANITA. Gregarious undershrubs roughly carpeting the forest floor, the main stems creeping or trailing, rooting, the erect branches 3 to 6 or 9 inches high; branchlets, petioles and rachises darkish or brownish, minutely puberulent; leaf-blades obovate or oblong-oblanceolate, obtuse and mucronate, or abruptly acute, glabrous or minutely puberulent, reticulate with dark veins, 7 to 12 lines long; panicle reduced to a raceme, small and compact (about ½ inch long); pedicels glabrous, 1 to 2 lines long; corolla pinkish, 2 lines long; ovary glabrous; berry subglobose, dark carmine, smooth, glabrous, 2 to 3 lines in diameter; nutlets distinct or partly united, narrow, ridged.

Open pine woods: Sierra Nevada, 6000 to 9000 (or 12,000) feet, from Tulare Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges (inner ranges mostly, rarely in the middle range), 4700 to 7000 feet, from Mendocino Co. to western Siskiyou Co. North to southern Oregon. June-July.

Field note.—Arctostaphylos nevadensis is a characteristic feature of open pine woods at high elevations in the Sierra Nevada, forming rough mats 3 to 10 feet broad and 6 to 16 inches high. It is rare or at least seldom reported in the southern Sierra Nevada south of Mariposa County; it is common northward. On the ridges about the base of Lassen Peak proper, for example, it forms extensive low brush fields in the scattered stand of Pinus contorta var. murrayana, Pinus monticola and Tsuga mertensiana, and on some ridges is almost the only woody species aside from the arboreous growth. Taxonomically it is very near Arctostaphylos hookeri Don.

Locs.—Sierra Nevada: Mt. Moses, Tulare Co., *Purpus* 1369; White Chief Cañon, Mineral King, Sawtooth Range, *Sanford Holley;* near Daulton Mdw., Kaiser Peak, Fresno Co., *Jepson;* Glacier Pt., Yosemite, *Jepson* 5678; McClure Fork Merced River, *Jepson* 3223; Stanislaus Mdw., Alpine Co., *Jepson;* Angora Lake, Eldorado Co., *Ottley* 867; Mt. Tallac, *Jepson* 8136; Big Silver Creek, Eldorado Co., *Kennedy* 228; Summit sta., Nevada Co., *Jepson* 20,924; Mineral, Tehama Co., *J. Grinnell;* Manzanita Creek, Lassen Peak, *Jepson* 15,316; Warner Mts., e. Modoc Co., *B. C. Goldsmith* 31; Horse Camp, Mt. Shasta, *Jepson* 14,717. North Coast Ranges: Mt. Hull, *W. W.*

Mackie; Soldier Ridge, se. Trinity Co., *Jepson* 14,718; South Fork Mountain, *Chesnut & Drew;* Trinity Summit, *Jepson* 2047; Shackleford Creek, w. Siskiyou Co., *Butler* 101. Ore.: Ashland Butte, *Jepson.*

Refs.—ARCTOSTAPHYLOS NEVADENSIS Gray, Syn. Fl. 2:27 (1878), type loc. "Sierra Nevada, 8000 to 10,000 ft."; Jepson, Fl. W. Mid. Cal. ed. 2, 313 (1911), Man. 748 (1925). *Uva-ursi nevadensis* Abrams, N. Am. Fl. 29:94 (1914).

6. **A. myrtifolia** Parry. Ione Manzanita. Low diffuse shrub ¾ to 1¼ feet high, the stems decumbent or spreading; branchlets of the season glandular-hirsute with stiff spreading hairs, the older branchlets glabrous, mostly glaucous or gray; bark of branchlets shreddy; leaf-blades narrowly ovate, sometimes elliptic or oval, mostly obtuse at base, acute (or rarely obtuse) and mucronate at apex, 3 to 6 (or 9) lines long, microscopically hirsutulose or glabrous; corolla small (2 lines long); berry globose.

Rocky or shaly slopes, 400 to 800 feet: Amador Co. foothills between Sutter Creek and Jackson Creek. Jan.-Feb.

Field note.—Arctostaphylos myrtifolia forms pure colonies. The low shrubs have a red-brown color which is distinctive. On this account the traveler can recognize this species over a considerable extent of country between Ione and Buena Vista. The colonies are often circular or band-like (⅛ mile long and 80 yards wide); they are sharply defined and when band-like sometimes march across the summit of a hill-top like a "fire lane." Those rocky hills where it grows also support high chaparral, Arctostaphylos viscida and scrub Quercus wislizenii, with an occasional tree of Pinus sabiniana. From a point on the Buena Vista road one may observe about 1200 acres of pure colonies of Arctostaphylos myrtifolia.

The main stems of the bushes are much flattened vertically. They become ¾ to 1½ inches broad and 2 to 5 lines thick. The degree of flattening varies, but the stems are often remarkably thin, suggesting broad ribbons, though much contorted or twisted. They are always dead on the upper side, but bear a cord-like band of living tissue on the lower side. Jos. E. Adams (a student of the author) has studied the tissues of such stems anatomically and it is his view that the peculiar structure is pathogenic although he was unable to discover a specific organism (Madroño 2:147–152). He did, however, make the important observation that such flattening of the stem may also occur in shrubs of Arctostaphylos viscida in the same local region and that occasional shrubs of A. myrtifolia do not exhibit flattened stems.

Locs.—Ione, *Jepson* 15,206; Buena Vista, *Jepson* 9961.

Refs.—ARCTOSTAPHYLOS MYRTIFOLIA Parry, Pitt. 1:35 (1887), type loc. ridges e. of Ione, *Parry;* Jepson, Man. 748 (1925). *Uva-ursi myrtifolia* Abrams, N. Am. Fl. 29:100 (1914). *A. nummularia* var. *myrtifolia* Jepson, Madroño 1:85 (1922).

7. **A. nissenana** C. H. Merriam. Eldorado Manzanita. Erect shrub, 3 to 6 feet high; bark reddish-brown, roughly fissured into narrow longitudinal strips; branchlets and petioles hirsute or hirsutulose with spreading hairs; leaves rather densely clothing the somewhat virgate or fastigiate branchlets, the blades elliptic to ovate, mostly obtuse, mucronulate, ¾ to 1 inch long, light green and thinly puberulent when young, glabrate and white-glaucous in age; petioles ½ to 1 line long; corolla at first pinkish, later white, 2½ lines long; ovary glabrous; berry glabrous.

Dry ridges, 1600 to 3500 feet: Sierra Nevada foothills in Eldorado Co. between the North Fork Mokelumne River and North Fork American River. Mar.

Field note.—Arctostaphylos nissenana has been an obscure species and still remains in great degree so. It was published without any description of the flowers or fruit and without notes upon the life-history behavior. Search for it by the author at the easily accessible type locality has been unsuccessful. Since its publication in 1918 perhaps only a half-dozen shrubs have been seen by this writer. It is, however, doubtless not so extremely rare as would appear. When associated with Arctostaphylos viscida it is, on account of its habit, hue and foliage, very easily passed by for that species. The rough bark of the main trunk and branches furnishes the most ready means for identification in the field. The longitudinal strips of bark become somewhat loose and often impart a shaggy appearance to the trunk or main stems. On the branchlets, one to five years old, the bark is smooth or smooth by exfoliation. The branchlets are usually rather strictly erect. The leaves are markedly erect and persist two to four years, thus clothing for 8 to 14 inches the terminal portion of the branches. Crown sprouting does not occur. This description of the shrub is based chiefly on field observations near Placerville, about 8 or 9 miles from the type locality. Non-typical shrubs occur in the chaparral which appear to be hybrids. The suggestion obtrudes, however, that A. nissenana may itself be a hybrid between A. viscida and A. nissenana var. arcana.

Var. **arcana** Jepson var. n. Shrub 4 to 7 feet high; leaves congested at the ends of the short branchlets, the blades elliptic, obtuse, mucronulate, 5 to 9 lines long; flowers 5 to 8 in close clusters; ovary and berry glabrous.—(Frutex 3–6 ped. altus; ramulus breve, foliis congestis; foliorum lamina elliptica, obtusa, mucronulata, 5–9 lin. longa.)—Dry rocky slope, 2100 feet: near Placerville (type, *Jepson* 18,609).

Ref.—ARCTOSTAPHYLOS NISSENANA C. H. Merriam, Proc. Biol. Soc. Wash. 31:102, pls. 4, 5 (1918), type loc. 2 to 3 mi. n. of Louisville, near top of a low ridge sw. of American Flat, 2300 to 2400 feet, Eldorado Co., *C. H. Merriam*. Var. ARCANA Jepson.

8. **A. patula** Greene. GREEN MANZANITA. Widely or diffusely branching shrub 3 to 5 (or 8) feet high; peduncles and rachis of inflorescence, and commonly the branchlets, minutely glandular-puberulent and darkish; leaves bright green, glabrous, the blades typically orbicular or broadly elliptic, mostly rounded at apex, or obscurely acutish, rounded or subcordate at base, 1 to 1½ (or 2¼) inches long; panicle corymbose, very dense; bracts ovate, abruptly attenuate; pedicels glabrous, 2 to 3 lines long; sepal tips white-scarious; corolla deep pink; berry commonly dark or black when half-grown, when mature globose or commonly depressed, glabrous, often very hard, 4 to 5 lines broad; nutlets smooth on sides and back, not channeled.

Open pine woods, 3500 to 9100 feet, or as low as 2500 at the north: high montane Southern California in the San Jacinto, San Bernardino and San Gabriel mountains; Sierra Nevada from Kern Co. to Siskiyou Co.; North Coast Ranges from the Yollo Bolly Mts. to the Siskiyou Mts. East to Nevada, north to Oregon. Mar.-June.

Geog. note.—The belt of Arctostaphylos patula in the Sierra Nevada is to a large degree coincident with that of Pinus ponderosa, but the Green Manzanita ranges to higher altitudes than the Western Yellow Pine, being often found in open stands of Jeffrey Pine. This manzanita is commonly a dominant and is usually the only species of its genus in the main portion of its belt, although it may be found associated with Arctostaphylos nevadensis at higher elevations. Throughout its entire distribution it is extremely uniform in aspect, in habit, in hue of leaf and in inflorescence. The dark green foliage of the shrub is a marked feature, as is also the behavior of the root-crown. The panicle is commonly broad, flattish and compact, and its glandular-puberulent rachis is often dark in color, while the bracts are commonly ovate-attenuate. The berries when three-fourths grown are sometimes rather hard with the nutlets and pulp as if concreted. Considering its wide range it may be said to be the least variable species of this genus, as the genus occurs in California. It inhabits mountain slopes, granitic plateaus, and talus drift; it grows on the arid east wall of the Sierra Nevada in Inyo County where it is associated with Cercocarpus ledifolius between 7000 and 9000 feet, on the great forested ridges between the forks of the Merced River and on the lava fields of northeastern Shasta County, and it is an important constituent of the brushy ridges of Siskiyou County where the seasonal rainfall reaches 40 to 60 inches. Since it often occurs in thin stands in the Sierra Nevada and, even more significantly, because its most characteristic region is high above the chaparral belt of the Upper Sonoran, it is not so subject to fire ravage as many other species of the genus. In most of its area there may be two or three feet of snow on the ground when the shrubs are in flower. However, it forms a globose or tuber-like root-crown at or near the surface of the ground which has the capacity to sprout after fire. The shrub also roots by layering of the decumbent lower branches (especially when weighted by snow) and tends to spread in circles in this way.

Locs.—S. Cal.: Tahquitz Peak, San Jacinto Mts.; Mill Creek, San Bernardino Mts., *Jepson* 5589; divide betw. Bear Valley and Santa Ana Cañon, San Bernardino Mts., *Parish* 19,288; North Baldy, San Gabriel Mts., *Peirson* 143. Sierra Nevada (both west and east slopes): Greenhorn Mts., acc. *Peirson;* Cottonwood Creek, Inyo Co., *Jepson;* Lloyd Mdws., upper Kern River, *Jepson* 4891; Garfield Forest, South Fork Kaweah River, *Jepson* 4664; Whitney Creek, Mt. Whitney, *Jepson* 1100; Millwood, Fresno Co., *Jepson* 2778; Lake Florence, *Jepson;* Huntington Lake, *E. Ferguson* 381; Mariposa Grove, *Jepson* 5659; Glacier Pt., Yosemite, *Jepson* 5645; Bald Mt., near Sonora, *A. L. Grant* 667; Strawberry, Tuolumne Co., *A. L. Grant* 22; Meyers sta., Eldorado Co., *F. B. Herbert;* Mt. Tallac, *Jepson* 8132; Sierraville, *Jepson;* Pioneer road sta., 2 mi. e. of Bassett sta., Sierra Co., *Jepson* 16,852; Walker Plain, Plumas Co., *Jepson;* Taylorsville, Plumas Co., *Jepson* 8017; Hot Springs Valley, Lassen Peak, *Jepson* 12,285; Gold Run Creek, Susanville, *Jepson:* Upper Fall River Valley, ne. Shasta Co., *Jepson* 5775; McCloud, *Jepson* 5743; Happy Camp Mt., Warner Mts., *L. S. Smith* 1503. North Coast Ranges: Snow Mt.; South Yollo Bolly, *Jepson* 14,722; Horse Mt., Humboldt Co., *Tracy* 8135; Trinity Summit, *Jepson* 2062; Sisson, Siskiyou Co., *Jepson* 14,720; Marble Mt., Siskiyou Co., *Chandler* 1100; Yreka Hills, *Butler* 586; Weed, Siskiyou Co., *Butler* 657.

Refs.—ARCTOSTAPHYLOS PATULA Greene, Pitt. 2:171 (Sept. 28, 1891), "Sierra Nevada from Calaveras Co. southward to Fresno"; Merriam, N. Am. Fauna, 16:157 (1899); Jepson, Man. 746

(1925). *A. pungens* var. *platyphylla* Gray, Syn. Fl. 2:28 (1878), type from "California, especially northward." *A. platyphylla* Ktze., Rev. Gen. Pl. 2:385 (1891; the preface to the set presumably written "im September," and thus the volumes probably published later). *Uva-ursi patula* Abrams, Bull. N. Y. Bot. Gard. 6:433 (1910). *A. patula* var. *incarnata* Jepson, Madroño 1:80 (1922), type loc. Dunsmuir, *H. P. Kelley*.

9. **A. stanfordiana** Parry. Myacoma Manzanita. (Fig. 297.) Erect shrub 3 to 6 feet high with slender dark red stems; leaves glabrous, bright green on both faces, the blades narrowly ovate to oblanceolate, most frequently acute at both ends, 1 to 1½ inches long, very erect; branchlets, peduncles and rachis glabrous or obscurely or microscopically glandular-puberulent; flowers light pink to lilac; corolla 2 to 3 lines long, very frequently with an obscure constriction just below the middle; ovary glabrous; berry very small, usually much depressed and commonly unsymmetrical or irregular, or sometimes globose, glabrous, usually a bright apple-red when first mature, 1½ to 3 lines high, 3 to 4 lines broad; nutlets broader than high, commonly 3-nerved and rugulose on back.

Mountain summits and ridges, 1000 to 3500 feet: Del Norte Co.; Yollo Bolly Mts. (both sides); Mayacamas Range (both sides); south to the Napa Range; also in Hoods Peak Range (north end); Mt. Diablo. Jan.-Feb.

Field note.—Arctostaphylos stanfordiana keeps to the summits of ridges and plateaus and is often associated with A. manzanita in the Napa Range. On Howell Mt. it is found on a white clay derived from a volcanic tuff. It is a smaller shrub than Arctostaphylos manzanita, and has bright green shiny leaves which are different in aspect from the dull green leafage of A. manzanita and smaller. Arctostaphylos stanfordiana is shallow-rooted and is killed outright by fire and depends solely upon its seeds for holding its territory. Seedlings show marked vitality in repossessing a fire-burned area. The berries are small and commonly irregular in shape, sometimes singularly unsymmetrical as if without definite form, or typical only in deformation. While they are usually depressed, they may also be produced upwards. When fully mature they are of a peculiar dark red color.

Locs.—Gasquet, Del Norte Co.; Red Rock, ne. of Round Valley, Mendocino Co., *Jepson;* Mt. Hull; Forty Dollar Mt., Mayacamas Range, *Jepson* 9239; Mendocino Range (sw. of Ukiah), *Jepson* 7629; Franz Valley, w. of Calistoga, *Wiggins* 5768; Mt. St. Helena, *Jepson* 14,724; La Jota, Howell Mt., *Jepson* 14,723; Sycamore Creek (head of), Mt. Diablo, *Jepson* 9653.

Refs.—Arctostaphylos stanfordiana Parry, Bull. Cal. Acad. 2:493 (1887), type loc. "mountain slopes in the vicinity of Calistoga," that is, in the Napa Range, *Parry;* Jepson, Univ. Cal. Mag. 2:102, pl. (1896), Fl. W. Mid. Cal. 371 (1901), ed. 2, 314 (1911), Man. 747 (1925). *Uva-ursi stanfordiana* Abrams, N. Am. Fl. 29:96 (1914). *A. laevigata* Eastw., Leafl. W. Bot. 1:76 (1933), type loc. Mt. Diablo (half-way up on old south side road), *Eastwood* 11,082; rachises and branchlets "minutely puberulent,"—specimens of A. stanfordiana from the type region are, however, often microscopically puberulent. *A. hispidula* Howell, Fl. Nw. Am. 415 (1901), type loc. Gasquet (w. of), Del Norte Co., *Howell;* closely related to A. stanfordiana (Eastwood, Lflts. W. Bot. 1:115). *A. densiflora* M. S. Baker, Lflts. W. Bot. 1:31 (1932), type loc. Vine Hill School, 10 mi. w. of Santa Rosa, *M. S. Baker* 5045; the author of the species compares it carefully with A. stanfordiana.

10. **A. elegans** Jepson. Konocti Manzanita. Erect shrub 5 to 10 (or 12) feet high; bark a lively red-brown; herbage glabrous; leaf-blades elliptic to ovate, obtuse or acute, bright green, 1 to 1¾ inches long; petioles 3 to 4 lines long; rachis microscopically puberulent, the pedicels glabrous; panicle ample; flowers white, 3 lines long; ovary thickly papillate-glandular; berry depressed-globose, 6 to 7 lines broad, 4 lines high, all over minutely stipitate-glandular or muriculate-glandular; nutlets 5 to 7, 2 or 3 consolidated.

Wooded or brushy slopes, 2000 to 4200 feet: Coast Range mountains bordering Clear Lake and south to Mt. St. Helena. Mar.

Hist. note.—Arctostaphylos elegans was first collected in 1892 on the obsidian ridges about Mt. Konocti along the old wagon trail from Lower Lake to Kelseyville. The exact locality is at a point on the southwest side of the sprawling lower slopes of the mountain where the road approaches nearest the main mountain mass. Many years later it was found on the east slope of Mt. St. Helena (*Eastwood*, in 1902) and in recent years (1928) on the southwest slopes of Snow Mt. in northern Lake Co. (*M. S. Baker* 3127c). It does not crown-sprout and is, in this respect,

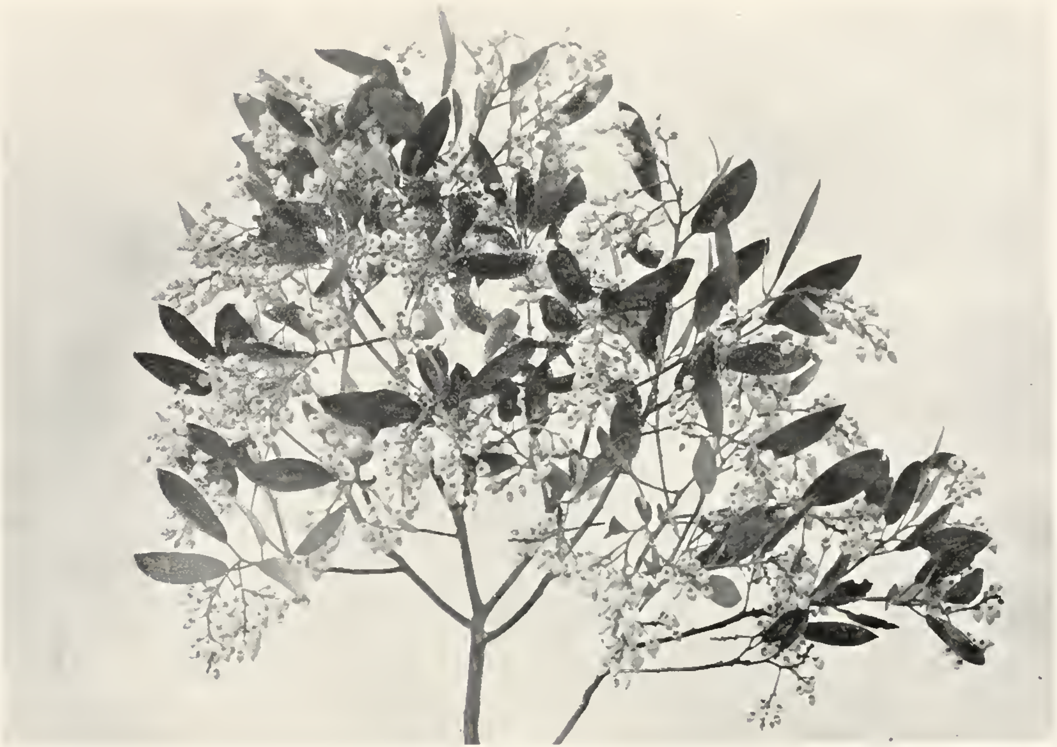

Fig. 297. ARCTOSTAPHYLOS STANFORDIANA Parry. Flowering branchlet. La Jota Falls, Howell Mountain, Napa Co., Feb., 1896. Associated with Arctostaphylos manzanita, it flowers earlier than that species. Photo. Geo. Wilcox.

similar to A. stanfordiana which it resembles somewhat in the character of its foliage and branchlets. The pericarp of the fruit dehisces irregularly, releasing the nutlets; rarely it is almost regularly circumscissile.

Refs.—ARCTOSTAPHYLOS ELEGANS Jepson, Erythea 1:15 (1893), type loc. obsidian slopes south of Mt. Konocti (Uncle Sam Mt.), Lake Co., *Jepson* 14,729; Man. 747 (1925).

11. **A. manzanita** Parry. PARRY MANZANITA. (Fig. 298.) Shrub 6 to 12 feet high, commonly very erect, sometimes widely branched from the base with long straggling crooked branches, sometimes becoming almost elephantine in its proportions and up to 22 feet high; branchlets, peduncles, and rachis finely puberulent or somewhat canescently puberulent; pedicels glabrous; leaves commonly dull green, often with a faintly purple venation, thick, glabrous or very minutely puberulent, the blades elliptic or oblong, acute or subacute at apex, acute or obtuse at base, 1 to 1½ inches long; panicles drooping; flowers white, sometimes pink-tinged; bracts triangular-acute or -acuminate, small and dry; ovary glabrous or essentially so; berry subglobose though a little depressed, dull white in early summer, becoming deep reddish brown in late summer and autumn, smooth and glabrous, 4 to 5 lines in diameter; nutlets irregularly coalescent or separate, keeled or ridged and roughened on back, and often with 2 small lateral ridges.

Dry clay, gravelly or rocky slopes in the foothills, 250 to 2500 (or 4200) feet: North Coast Ranges (middle and inner ranges only or mostly) from Napa and Solano Cos. to western Shasta Co.; Sierra Nevada foothills from Tuolumne Co. to eastern Shasta Co. Nov.-Mar.

Field note.—In the Pinus ponderosa lower border chaparral, Arctostaphylos manzanita is an important species in northern California. On Howell Mountain in the Napa Range it is everywhere associated with Western Yellow Pine or occurs just below it altitudinally. A very extensive formation of Arctostaphylos manzanita is found between Mt. St. Helena in Napa County and Lower Lake village in Lake County. This region of low hills has been swept by innumerable fires, especially during the last ninety years. Destruction by fire and logging by man has diminished the thin stand of Pinus ponderosa but occasional trees still linger as relics, the present stand of Parry Manzanita occurring mainly as a lower border to the pine. West of Lower Lake the terrain rises and here Arctostaphylos manzanita is replaced by Arctostaphylos elegans. In central Mendocino Co., especially in Long Valley, Arctostaphylos manzanita is not only associated with Western Yellow Pine but also forms fine colonies as a lower border to it. Likewise at the lowest altitudes of Yellow Pine in the northern Sierra Nevada foothills this manzanita may be found with that pine and especially just below it. The presence of Arctostaphylos manzanita and the absence of Pinus ponderosa in a range such as the Vaca Mts., where the woodland complex has been changed by increasing aridity and by long-repeated forest fires, may be an indication that Pinus ponderosa was present at an earlier time and that its border associate is fitted to persist under somewhat more severe conditions. Throughout its range generally Arctostaphylos manzanita occurs as an associate of other shrub species in typical chaparral, but is also found as pure colonies in opens of woods.

Parry Manzanita is the largest species of the genus, though the trunk of Arctostaphylos glauca may become as massive. Where it inhabits moist valley flats or rich montane ridges and where on account of favorable situation it has been protected from fire for a long period it may become arborescent and attain considerable size. On the lower westerly slopes of Howell Mt. individuals have been measured as follows: (a) by Stingy Stile on trail to Adam-and-Eve, height 15 feet, trunk 4 feet high before branching into four arms, its diameter 1 foot, 2 inches at 3 feet above ground; (b) on trail to Adam-and-Eve, height 18 feet, trunk 2 feet high before branching into 5 arms, its diameter 1 foot, 2 inches at 1½ feet above ground; (c) on little ridge west of Lyons Valley, height 22 feet, trunk 1 foot 8 inches high before branching into 2 arms, its smallest diameter (at ground) 11⅔ inches; (d) in gully below Four Corners, 12 feet high, trunk 22 inches in diameter at ground (Jepson Field Book, 31:172–173. 1915. ms.); on trail to Sanitarium below Four Corners, height 14 feet, trunk branching at 18 inches from ground, diameter 20 inches at 4 inches above the ground, 26 inches at 18 inches above the ground; on trail to Adam-and-Eve, height 14½ feet, trunk parting at 1 foot into many branches, circumference 6 feet ¼ inch at 6 inches above ground (Jepson Field Book, 57:29–32. 1936. ms.).

The shrubs are completely killed by fire and do not sprout from the root-crown. Sometimes a shrub is consumed but frequently the effect of fire is simply lethal. Individuals thus killed, both of Arctostaphylos manzanita and A. stanfordiana, may, therefore, stand as skeletons on the slopes after fires, but the skeletons of the latter usually go down under the first winter's storms while those of A. manzanita may stand for three or four years before overthrown. The lack of regenerative vitality in the vegetative organs of Arctostaphylos manzanita is further evidenced by the following note from J. P. Tracy: "This manzanita lacks even the power of sprouting from live branches when the green foliage is lopped off. I have never seen new sprouts arise anywhere from branches or branchlets that have developed the red bark."

On fire burns seedlings of Arctostaphylos manzanita appear in large numbers. They produce fruit at an early age, often in ten or twelve years. All this gives evidence that this species is a true fire-type shrub. It is furthermore believed that the seeds hibernate in the soil during a prolonged fire interval and have the capacity to respond to heat shock after a long period of years. Except on the margins of its distribution it is an aggressive species. In the Napa Range it overruns abandoned vineyards and neglected man-cleared pastures in the hills, often forming dense pure stands 8 to 13 feet high, the crown surface of the area as seen from a little distance looking almost as close and smooth as a meadow. Such colonies form a nurse bed for seedlings of Arbutus menziesii and more particularly Quercus kelloggii and Pseudotsuga taxifolia, which species finally overtop and sometimes suppress the manzanita.

Arctostaphylos manzanita is closely allied to A. stanfordiana but there are various points of difference to be observed. The leaves in Arctostaphylos stanfordiana are very erect and bright shining green; in A. manzanita they are less erect, dull green and sometimes a little grayish in hue. In both these species the panicles with their embryonic flower buds are produced at the beginning of the dry season in early June or July and are thus made ready long in advance for the flowering in midwinter, but there are certain points of difference: during the fall period the panicles in A. manzanita are drooping; in A. stanfordiana they are erect or nearly so. The period of anthesis in A. manzanita begins earlier than in A. stanfordiana in the same locality and closes earlier, though overlapping. Arctostaphylos manzanita is a large shrub or small tree with somewhat loose or spreading branches. Arctostaphylos stanfordiana is a smaller shrub with a trim habit due to its closely erect branches.

Locs.—North Coast Ranges: Gates Cañon, Vaca Mts., *Jepson* 14,706; Howell Mt., Napa Range, *Jepson* 14,711; Mt. St. Helena, *Jepson* 7669; Wilbur Sprs., sw. Colusa Co., *Jepson;* Hough Sprs., ne. Lake Co., *Jepson* 9005; Mayacamas Mts., betw. Blue Lakes and Ukiah, *Jepson* 14,713; Mendocino Range (Gould's ranch, sw. of Ukiah), *Jepson* 7631; Long Valley, cent. Mendocino Co., *Jepson* 9424; Piercy, South Fork Eel River, nw. Mendocino Co., *Jepson;* Blue Rock Ridge, betw. Cummings and Bell Sprs., *Tracy* 15,270; betw. Three Creeks and Willow Creek, n. Humboldt Co., *Tracy* 6043; Ely, sw. Tehama Co., *Jepson* 16,332; Redding, *Blankinship.* Sierra Nevada foothills: Columbia, Tuolumne Co., *Jepson* 6397; Bear Mts., s. of Harmon Peak, Calaveras Co., *Jepson* 10,202; Gwin Mine, Calaveras Co., *Jepson* 1796; Buena Vista, Amador Co., *Jepson* 9959; Shingle Sprs., Eldorado Co., *F. B. Herbert;* Big Chico Creek, Butte Co., *Heller* 11,152; Los Molinos, Tehama Co., *H. P. Kelley;* Payne Creek sta. (above), e. Tehama Co., *Jepson* 12,260; Old Cow Creek, near Whitmore, Shasta Co., *Jepson.*

Refs.—ARCTOSTAPHYLOS MANZANITA Parry, Bull. Cal. Acad. 2:491 (1887), type loc. "lower foothills of the Coast Range north of San Francisco," *Parry,* that is, Napa Range near Calistoga, as per Parry's collection label; Jepson, Fl. W. Mid. Cal. 371 (1901), ed. 2, 313 (1911), Man. 747, fig. 729 (1925). *Uva-ursi manzanita* Abrams, N. Am. Fl. 29:96 (1914). *A. manzanita* var. *apiculata* Jepson, Madroño, 1:83 (1922), type loc. Weldon Cañon (head of), Vaca Mts., *Jepson* 7198; berry with a conical apiculation.

12. **A. parryana** Lemmon. PARDNERS MANZANITA. Shrub, 3 to 5 feet high; branchlets and rachis whitish-puberulent, non-glandular; leaf-blades broadly elliptic to ovate, mostly obtuse, thickish, glabrous or nearly so, minutely purple-veined, ¾ to 1⅛ inches long; pedicels glabrous; corolla white, (2½ or) 3 to 4 lines long; ovary glabrous; berry glabrous or nearly so, the stone solid, obscurely about 6-ridged or -angled.

Dry montane slopes and cañon floors, 4000 to 6000 feet: Tehachapi Mts. and Mt. Pinos region; south to the San Gabriel Mts. May.

Locs.—Tehachapi Mts.; San Emigdio Cañon, *Davy* 2029; Mt. Pinos, *J. Grinnell;* Mt. Gleason, *Peirson* 429; San Antonio Cañon, San Gabriel Mts.; Mt. San Antonio (Dav. & Mox., Fl. S. Cal. 272).

Refs.—ARCTOSTAPHYLOS PARRYANA Lemmon; Greene, Pitt. 2:68 (1890), type loc. Keene sta. (4 mi. w. of), Tehachapi Mts., *Lemmon* (cf. Madroño 1:89); Jepson, Man. 750 (1925). *Uva-ursi parryana* Abrams, Bull. N. Y. Bot. Gard. 6:432 (1910).

13. **A. mewukka** C. H. Merriam. APPLE-BERRY. Shrub 3 to 6 feet high; branchlets glabrous, the peduncles and rachises glabrous or minutely puberulent; foliage light-green; leaf-blades elliptic-oblong, or -obovate, varying to oblong-lanceolate and somewhat willow-like, mostly acute, glabrous and glaucous, 1 to 1¾ or 2½ inches long; pedicels glabrous; panicles loose, erect or only half-drooping; ovary depressed, roughened but glabrous; or sometimes sparsely hairy, not glan-

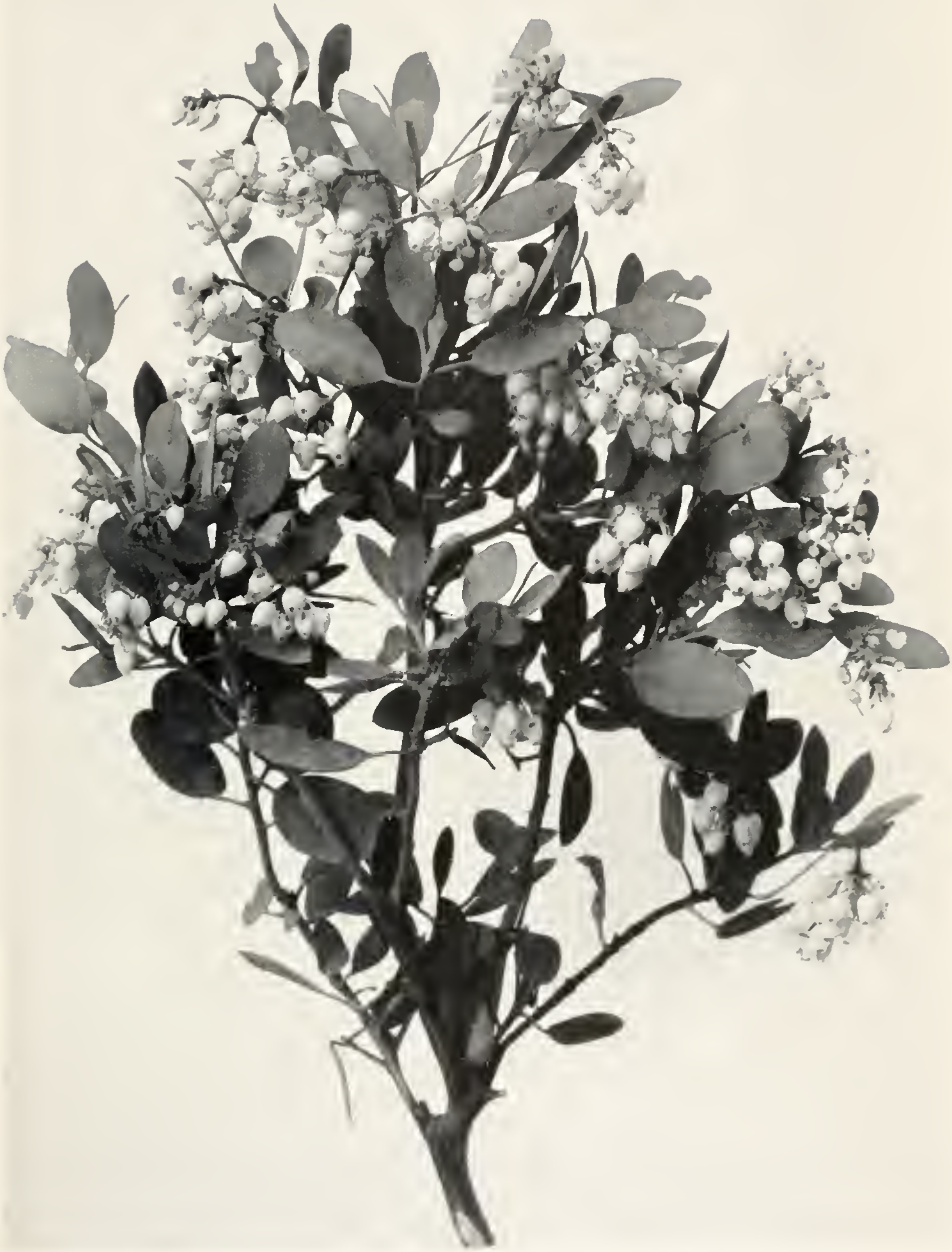

Fig. 298. ARCTOSTAPHYLOS MANZANITA Parry. Flowering branchlet. Howell Mountain, Napa Co., Feb., 1896. Extensive clearings of brush lands were made in the hills of the Napa Range sixty or seventy years since for agricultural purposes. During the last ten to fifteen years many ranches have been abandoned. Wherever the hand of man is removed Arctostaphylos manzanita moves promptly into a vineyard, an orchard or a pasture and repossesses its ancient domain. Photo. Geo. Wilcox.

dular; berry elevated-globose or globose, dull white or later light brown, 4 to 6 or 8 lines broad; nutlets 4 or 5, or sometimes coalescing into one channeled or ribbed stone, the stone forming tardily.

Dry slopes, 2500 to 4500 (or 5700) feet: Sierra Nevada foothills from Placer Co. to Tulare Co. Feb.-Apr.

Biol. note.—Arctostaphylos mewukka occurs chiefly in a belt between A. patula on the upper side and A. viscida (or A. mariposa) on the lower side, though less abundant than any of those species. It was first named by the zoölogist, Clinton Hart Merriam, although he omitted from his description the most important biological fact concerning it, namely that this species does not sprout from the root-crown after fire. Its berry was used as a food by the native tribes and also by white settlers. It is of interest that, as naturalists have observed, the native squirrels of the Pinus ponderosa belt differentiate between Arctostaphylos mewukka and A. patula; they eat the berries of the former but not those of the latter.

Locs.—Shingle Sprs., Eldorado Co., *F. B. Herbert*; Yankee Hill, Columbia, *A. L. Grant* 598; Bald Mt. near Sonora, *A. L. Grant* 553; Strawberry, Tuolumne Co., *A. L. Grant* 888; Cold Spr., North Fork Tule River, *Jepson* 4704.

Refs.—ARCTOSTAPHYLOS MEWUKKA C. H. Merriam, Proc. Biol. Soc. Wash. 31:101 (1918), type loc. Colfax (3 mi. above), on ridge between North Fork American River and Bear River, *C. H. Merriam*. *A. pastillosa* Jepson, Madroño 1:83, 93 (1922), type loc. Cold Spr., Tuolumne Co., *Jepson* 6456; Jepson, Man. 748 (1925).

14. **A. pungens** H. B. K. MEXICAN MANZANITA. Shrub (2 or) 3 to 8 feet high; branchlets puberulent or sometimes white-tomentulose; leaf-blades oblong to elliptic, abruptly or somewhat obscurely short-acute, mucronate, finely pubescent or microscopically tomentulose, eventually glabrate or often rather glossy, 8 to 10 lines (rarely to 1¼ inches) long; pedicels glabrous; panicles small, (¼ to ¾ inch long) or reduced to a raceme; berries usually somewhat depressed-globose and 3 to 4 lines broad, but variable in size and sometimes eccentric in shape, glabrous, dark-brown or terra-cotta, shining; nutlets distinct, dorsally ridged.

Sandy summits or rocky slopes, 800 to 5500 feet: Marin Co.; South Coast Ranges; south to the San Jacinto Mts.; mountains of eastern San Diego Co. East to Arizona, south to Mexico. Mar.

Geog. note.—Arctostaphylos pungens is a shrub whose center of distribution is probably in the Mexican highlands. It ranges northward and has been collected at many stations in Arizona. The shrubs of eastern San Diego County appear to be quite typical and are thus well included in the species. Shrubs of Mt. Tamalpais (A. montana Eastw.), a feature of the serpentine on the southeasterly end of the Bolinas Ridge, have long been referred to this species by the writer. In these shrubs the branchlets and rachises are usually though not always canescently puberulent, while the branchlets and rachises in shrubs of cismontane Southern California are best described as minutely puberulent, though sometimes they are canescent. Aside from this, there is a wide geographic discontinuity between Marin County and the San Jacinto and Cuyamaca mountains, which has not been as yet satisfactorily bridged. The stations here cited for this interval are represented by specimens only in flower or only in fruit or lacking both flowers and fruit. Many stages in the way of specimens and essential facts as to the life-history are needed before clear judgment as to range is possible. The shrubs of Mt. Tamalpais, above referred to, have also an affinity with Arctostaphylos hookeri and might be referred to that species save for their thick leaves. The leaves of Arctostaphylos hookeri are relatively thin.

These Tamalpais shrubs are interesting. They are common locally on the high ridges of Mt. Tamalpais and distributed over the north slope as far as Lake Lagunitas and San Geronimo Ridge. As to habit, though not otherwise, this form is markedly variable. The following habit types have been observed: (a) on road to West Peak one-fourth mile ne. of Mountain Theatre, erect shrub 8 feet high, the distinct trunk 13 inches high and 4½ inches in diameter at 6 inches above the ground; (b) on road, within 50 yards easterly of preceding, shrub 14 inches high, many decumbent stems, forming a plant 5½ feet broad; (c) about ½ mile easterly from Mountain Theatre on Williams Trail along ridge to West Peak, shrub 6½ feet high, 24 feet broad, all the stems from one central root; (d) on Williams Trail at west foot of West Peak, shrub with trailing stems forming a circle 9 feet across, the ascending branchlets 8 to 12 inches high, thus making a large rough mat. This prostrate form may also be found on the Eldridge grade, north slope of the mountain, in places where outcropping serpentine makes "opens" in the chaparral (Jepson Field Book, 39:27, 28, 30,—1921; 57:21, 22,—1936. ms.). The trailing stems strike root, but there is no root-crown sprouting after fire.

Locs.—Marin Co.: Geronimo Ridge, *Ewan* 10,177; Lake Lagunitas, *Chesnut & Drew*; Mt. Tamalpais, *Jepson* 4761. South Coast Ranges: Picacho Peak, s. San Benito Co., *Hall* 9947; Stonewall Creek, Metz, Monterey Co.; La Panza, San Luis Obispo Co. San Jacinto Mts.: Hemet Valley (ridges above), *Wolf* 1953. San Diego Co.: Cuyamaca Mts.; Laguna Mts.; Live Oak Sprs., se. San Diego Co., *Jepson* 11,833; Jacumba, *Wolf* 1906; Campo, *Wolf* 2158.

Refs.—ARCTOSTAPHYLOS PUNGENS H. B. K., Nov. Gen. & Sp. 3:278, t. 259 (1819; cf. Bull. Torr. Club 29:597), type loc. Moran and Villalpando, Mex., *Humboldt & Bonpland* (cf. Sprague, Kew Bull. Misc. Inform. 1924:22); Jepson, Man. 747 (1925). *Uva-ursi pungens* Abrams, Bull. N. Y. Bot. Gard. 6:432 (1910). *A. montana* Eastw., Proc. Cal. Acad. ser. 3, Bot. 1:83 (1897), type loc. trail betw. Eldridge grade and Larsens [now Ridgecrest], Mt. Tamalpais, *Eastwood;* l.c. 1:127 (1898). *Uva-ursi montana* Abrams, N. Am. Fl. 29:95 (1914).

ARCTOSTAPHYLOS BAKERI Eastw., Lflts. W. Bot. 1:115 (1934), type loc. Occidental (2 mi. e. of, in a cypress grove, on serpentine), Sonoma Co., *J. T. Howell* 10,955; branchlets and inflorescence glandular-hispidulous; leaf-blades elliptic, scabridulous, 1¼ inches long; pedicels glabrous; berry glabrous (ex char.).

15. **A. glauca** Lindl. GREAT-BERRIED MANZANITA. Shrub 6 to 12 feet high, or almost arborescent and up to 22 feet high, with a trunk 4 to 15 inches in diameter; leaves glaucous and glabrous, their blades orbicular or elliptical to broadly ovate, obtuse or acute at apex, obtuse, truncate or subcordate at base, 1¼ to 1¾ inches long; petioles 3 to 7 lines long; panicle broader than high, frequently very compact; rachis glabrous, sometimes a little glaucous; pedicels covered with stipitate or subsessile glands; flowers rather large; corolla white or rarely pale pink; ovary glabrous but densely glandular; berry globose or elliptic, rather densely covered with minute glands and very viscid, 5 to 8 lines broad; pulp scanty; stone solid, smooth.

Dry montane slopes, 1400 to 5000 feet: Mt. Diablo and south through the Coast Ranges to San Luis Obispo Co.; cismontane and intramontane southern California; Conchilla Mts. South to Lower California. Dec.-Apr.

Field note.—Arctostaphylos glauca, which is geographically segregated from species of similar aspect, may be recognized in the field by its whitish foliage and by the single stone of its berry which is globose and smooth, thus differing from other species in which the nutlets though concreted give striking evidence of concretion by ridges and channels and by the degree of mutual attachment or fusion. This species becomes a large shrub and occasionally a small tree. Branches along the ground layer readily according to F. W. Peirson.

The northernmost locality is Mt. Diablo. In Donner Cañon one finds individuals 10 to 16 feet high with trunks 9 to 15 inches in diameter at the ground. There is also in Donner Cañon a very large individual half way up to the spring that lies below the East Peak. It is 18 feet high, the crown 24 feet broad, the trunk 63 inches in circumference at four inches above the ground. It branches freely, fully, densely. In the Mount Hamilton Range this species is common, especially on Cedar Mt., where it is the most abundant chaparral species, everywhere giving character to the country. It is there, as elsewhere, glaucous but shrubs of different shades are often found in close proximity, yellowish, light green, dark green and lavender.—Jepson Field Book, 35:26 (1918); 38:59 (1920); 34:191 (1917). ms. In the lower part of Mill Creek Cañon, San Bernardino Mts., is a small tree 22 feet high with a trunk 3 feet 3 inches in circumference at one foot above the ground (Jepson Field Book, 27:106. 1913. ms.).

Locs.—South Coast Ranges: Donner Cañon, Mt. Diablo, *Jepson* 7592; Las Trampas Ridge, Contra Costa Co., *Jepson* 6853; Cedar Mt., Mt. Hamilton Range, *Jepson* 6219; Loma Prieta, Santa Cruz Mts., *Davy* 504; Santa Lucia Creek, Santa Lucia Mts., *Jepson;* Peachey Cañon, San Luis Obispo Co., *Davy.* Cismontane and intramontane S. Cal.: Castaic Creek (mts. above), n. Los Angeles Co., *Jepson* 8929; Santa Inez Mts.; Cajon Pass, *Newlon* 465; Mill Creek, San Bernardino Mts., *Jepson* 5587; Indian Cañon, Collins Valley, ne. San Diego Co., *Jepson* 8857; Escondido, *C. V. Meyer* 686; Warner Ranch, e. San Diego Co., *Jepson* 8527; San Felipe Valley (nw. head of), *Jepson;* Alpine, San Diego Co., *G. L. Fleming;* Cuyamaca Mts., *Palmer.* Conchilla Mts. (nw. side of Colorado Desert): Piñon Well grade.

Refs.—ARCTOSTAPHYLOS GLAUCA Lindl., Bot. Reg. sub t. 1791 (1836), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 372 (1901), ed. 2, 314 (1911), Man. 746 (1925). *Uva-ursi glauca* Abrams, Bull. N. Y. Bot. Gard. 6:433 (1910). *A. glauca* var. *eremicola* Jepson, Madroño 1:78, 91 (1922), type loc. Piñon Well mountains, n. Colorado Desert, *Jepson* 6004; Man. 746 (1925).

16. **A. viscida** Parry. WHITE MANZANITA. Shrub 4 to 10 feet high, with very striking contrast between the white foliage and deep red crooked branches; branchlets and peduncles glaucous and very glabrous, usually reddish, the rachis of the raceme or panicle glandular, rarely nonglandular; leaves very white-glaucous, glabrous, the blades elliptic, varying to orbicular or round-ovate, obtuse or abruptly

acute, rounded at base, (¾ or) 1 to 1½ (or 2) inches long; panicles loose; pedicels 4 to 6 lines long, with short spreading glandular hairs; bracts small, ovate-lanceolate, acuminate; calyx-lobes reflexed over summit of pedicels; corolla light pink; ovary glabrous; berries deep red, globose, 3 to 4 lines broad, the surface very glandular, cohering in sticky masses when gathered, or often non-glandular; nutlets distinct or 2 or 3 united, ridged on back.

Dry rocky or clay slopes, 500 to 4400 feet: Sierra Nevada foothills in Tulare Co. and from Amador Co. to Tehama Co.; extending around the head of the Sacramento Valley into the inner North Coast Range and as far south as the Napa Range (east slope or easterly ridges). Feb.-Apr.

Field note.—Arctostaphylos viscida is remarkable for its glaucous branchlets and peduncles, and white foliage. In the Sierra Nevada it forms a broad band in the upper portion of the chaparral belt, where it is usually the only manzanita and often develops colonies with a closed cover. Throughout most of its range it is commonly a marked dominant in its area. On Tule River, for example, it is represented by a rather distinct band in the upper portion of the chaparral belt, but also occurs in the lower part as scattered individuals. In the central and northern Sierra Nevada it likewise forms extensive brush fields, the individuals mostly 4 to 5 feet high. Frequently the stand is of greater height. One mile north of Louisville, Eldorado County, a west hillslope exhibits a nearly pure closed formation 8 to 12 feet high, or 14 feet high at the top of the hill. Such a stand at this altitude (2100 feet) furnishes a nurse cover for Pinus ponderosa.

Occasional individuals may become sub-arboreus in size. Near Louisville one individual measured 14 feet in height with a trunk 10½ inches in diameter at 6 inches above the ground, the trunk nearly 1 foot high before branching. Shrubs which branch freely at the ground may become 1 to 3 feet in trunk diameter at the ground.

In the prevailing form the berries are very viscid-glandular, but in a given locality shrubs with non-viscid berries may be dominant. Commonly this species bears heavy crops of berries. Since Arctostaphylos viscida is killed outright by chaparral fires, this fact of fertility in seed production has relation to its character as a fire-type shrub. Seedlings on burns often appear in vast numbers.

Locs.—Sierra Nevada foothills: Middle Tule River betw. Springville and Nelson, *Jepson* 4861; North Fork Tule River, opp. Battle Mt., *Jepson* 4702; Buena Vista, Amador Co., *Jepson* 9958; Placerville, *Jepson* 18,607; Kelsey, Eldorado Co., *Jepson* 18,623a; Georgetown, Eldorado Co., *Margaret A. Kelley;* Rough and Ready, Nevada Co., *Jepson* 14,727; Oroville; Old Cow Creek, near Whitmore, Shasta Co., *Jepson* 10,667. North Coast Ranges: Oro Fino, Siskiyou Co., *Butler* 659; Delta, Shasta Co., *Jepson* 6178; Greasewood Hills, w. Tehama Co., *Jepson* 14,726; betw. Indian and Bear valleys, ne. Lake Co., *Jepson* 8977; Knoxville Ridge, *Jepson* 9047; Siegler Sprs., cent. Lake Co., *Blankinship;* Cobb Mt., *Tracy* 14,009; Moore Creek, Howell Mt., Napa Range (e. side), *Jepson* 6826; Chiles Creek near Chiles Mill, Napa Range, *Jepson* 9067.

Refs.—ARCTOSTAPHYLOS VISCIDA Parry, Bull. Cal. Acad. 2:492 (1887), type loc. Ione, Amador Co., *Parry;* Jepson, Man. 746 (1925). *Uva-ursi viscida* Abrams, N. Am. Fl. 29:99 (1914).

17. **A. mariposa** Dudley. MARIPOSA MANZANITA. Spreading shrub, 4 to 8 (or 21) feet high; branchlets and inflorescence glandular-pubescent or puberulent, the hairs mostly spreading; leaves very white-glaucous, glabrous or nearly so, very rigid, their blades oval to elliptic, shortly acute or at least mucronulate, 1 to 2 inches long; panicle many-flowered, small, compact; pedicels with glandular hairs; ovary glandular-hairy; berry bright red, glandular-viscid, sometimes covered with minute stipitate glands, 3 to 4 lines broad; nutlets distinct or 2 or 3 united, roughish and usually ridged both dorsally and laterally.

Arid hill slopes, 1500 to 4900 (or 6000) feet: Sierra Nevada, in the higher foothills, from Amador Co. to Kern Co. Mar.-June.

Field note.—The differences between Arctostaphylos mariposa and A. viscida are mainly those of glandulosity and the distribution of glands. For this reason A. mariposa seems a weak or unallowable species. On account of variability in the glandular character it is sometimes difficult to differentiate the two species where they meet. The berries in Arctostaphylos mariposa ripen a dull ivory white and change to a deep honey color with a reddish tinge. The new leaves of young shoots are green and form a marked contrast to the older white leaves. The inflorescence is very viscous-hairy. The embryonic panicles in Arctostaphylos mariposa and in A. viscida are similar and consist usually of 2 or 3 rather closely approximate branches. These branches are somewhat more slender in A. viscida than in A. mariposa. Like Arctostaphylos viscida, A. mariposa does not sprout from the root-crown after the shrub is fire-killed. Similarly its seedlings very promptly restock fire burns.

Locs.—Volcano, Amador Co., *K. Brandegee;* Murphys Camp, Calaveras Co., *Davy* 1525; Yankee Hill, Columbia, *Jepson* 6450; Confidence, Tuolumne Co., *Jepson* 7695; Big Creek, Big Oak Flat road, *Jepson* 8341; Snow Creek trail, Yosemite, *Jepson* 10,498; El Portal, Merced River, *Jepson* 5671; Chowchilla School, Mariposa Co., *Jepson* 12,792; Table Mt., Fresno Co., *Jepson* 15,122; Pine Ridge, Fresno Co., *Jepson* 16,103; Balch Park, Tulare Co., *Peirson* 11,826; betw. Kernville and Glenville, *Peirson* 8849.

Var. **bivisa** Jepson. Leaves dark green, 1½ to 2½ inches long; branchlets glandular-hairy and somewhat dusky; berry whitish or somewhat lucent.— Yosemite Park: Hetch-Hetchy, *Jepson* 3452; near Wawona.

Refs.—ARCTOSTAPHYLOS MARIPOSA Dudley; Eastw., Sierra Club Publ. 27:52 (1902), "Millwood and King's River Cañon," *Eastwood;* Jepson, Man. 746 (1925). *Uva-ursi mariposa* Abrams, N. Am. Fl. 29:99 (1914). Var. BIVISA Jepson, Madroño 1:79 (1922), type loc. Wawona, Mariposa Co., *Jepson* 5658. *A. jepsonii* Eastw., Lflts. W. Bot. 1:119 (1934), type loc. Stella Lake, Wawona, *J. T. Howell* 17.

18. **A. glandulosa** Eastw. EASTWOOD MANZANITA. Small or medium-sized shrub 2 to 3 (or 7) feet high with many stems arising from a widely spreading root-crown; stems with smooth bark; branchlets, peduncles and pedicels with a dusky more or less glandular indument or tomentum, sometimes the branchlets also bearing scattered and usually short spreading bristles which are more or less glandular; leaf-blades ovate to elliptic or oblong, mostly acute, rounded or subcordate at base, dark or yellowish green and often somewhat glandular, most commonly glabrous or apparently so, or sometimes with a fine pubescence, 1 to 1¾ inches long; pedicels glandular-hairy, the glandulosity often obscure, the hairs not dense, often thin and scattered; flowers in rather small and very compact clusters, white or pinkish; bracts lanceolate, the lower foliaceous; anther awns red; ovary white-hairy; berry globose or more commonly depressed, glabrate or under a lens usually showing very short very scattered white hairs, not at all glandular or sometimes viscid-glandular; nutlets distinct, rugose and ridged on the back.

On broken sandstone, 500 to 5000 feet: Coast Ranges from Del Norte Co. to San Luis Obispo Co.; south to San Diego Co. Mar.

Biol. note.—Guarded statements as to the validity of Arctostaphylos glandulosa Eastw. have been expressed by its author (Proc. Cal. Acad. ser. 3, 1:127,—1898), but it is fortunate that it is, in its type locality and in many other localities, a shrub with so strongly marked characters. Its capacity for reaction to chaparral fires is highly developed. The shrub is not killed outright by fire, since it regenerates from the base by new shoots. Woody tuber-like bodies are formed on the root-crown. These structures under the influence of repeated fires develop horizontally into broad or circular woody platforms of irregular outline (Fig. 291). On the Pipe Line Trail on Mt. Tamalpais many large root-crowns have been measured: one circle 6 feet 6 inches by 5 feet appeared as if composed of woody knots or partly burned chunks irregularly disposed on the surface or lying partly buried in the soil; another circle 8 feet 7 inches by 5 feet 8 inches was very perfect (Jepson Field Book, 28:60. 1914. ms.). These platforms possess the capacity to send up numerous shoots after fire. Successive chaparral fires burn the root-crown to some degree, as well as killing the crown of the shrub, but the effect of this injury is, like that of artificial scarifying, stimulating to lateral growth of the woody platform. The contrary effect, that is, complete destruction, is exceptional. Following accumulation of inflammable material over a period of many years the occurrence of fire in combination with days of low humidity, high insolation and north winds of gale force may result in destroying occasional root crowns. But even after intense chaparral fires the regenerative vitality of the shrub is very great. On one square inch of root-crown one of my students, W. C. Mathews, following a chaparral fire on Mt. Tamalpais, counted 47 sprouts. So it is that these shrubs become many-stemmed in a peculiar way. They are commonly 2 to 3 feet high, their stems rarely ever becoming more than 1 or 2 inches in diameter. Nor is it merely the number of the stems from the platform which is significant: other fire reactions are interesting, as for example, the earliest leaves on these regeneration shoots are coarsely serrate, which is, doubtless, the case in many species of the genus.

Locs.—Grasshopper Ridge, Canoe Creek, w. Humboldt Co., *Jepson* 16,479; Chamise Mt., n. of Bell's Sprs., n. Mendocino Co., *Tracy* 13,321; Red Mt., n. Mendocino Co., *Jepson* 16,523; South Mill Creek (head of), Ukiah, *Jepson* 9246; Mt. Konocti, *Blankinship;* Miller Cañon, Vaca Mts., *Jepson* 14,702; Twin Sisters Peak, Napa Range, *Jepson* 2391; Rock Spr., Mt. Tamalpais, *Jepson* 6802; Santa Cruz Isl.; Sycamore Cañon, Santa Inez Mts.; Echo Mt., San Gabriel Mts., *Peirson* 142; Chalk Hill, San Jacinto Mts.; Santiago Peak, Orange Co.; San Diego; Cuyamaca.

Refs.—ARCTOSTAPHYLOS GLANDULOSA Eastw., Proc. Cal. Acad. ser. 3, 1:82 (1897), type loc. Mt. Tamalpais, *Eastwood;* Jepson, Man. 749 (1925). *A. intricata* Howell, Fl. Nw. Am. 416

(1903), type loc. Gasquet (w. of), Del Norte Co., *Howell*. *A. subcordata* Eastw., Lflts. W. Bot. 1:61 (1933), type loc. Santa Cruz Isl. (w. end), *J. T. Howell* 6335; leaves subcordate at base or acute. *A. crustacea* Eastw., l.c. 1:74 (1933), type loc. Kings Mt., San Mateo Co., *Scale*. *A. rosei* Eastw., l.c. 1:77 (1933), type loc. Lake Merced, San Francisco peninsula, *L. S. Rose*. *A. zacaensis* Eastw., l.c. 1:79 (1933), type loc. Zaca Lake, Santa Barbara Co., *Eastwood* 681. *A. cushingiana* Eastw., Lflts. W. Bot. 1:75 (1933), type loc. Mt. Tamalpais (south slope), "abundant on lower slopes," *Eastwood* 11,075a; not at all or only slightly glandular; branchlets canescent, not bristly or only slightly so. [*A. glandulosa* var. *crassifolia* Jepson, Man. 749 (1925), lapsus calamitosus typographicus.]

19. **A. tomentosa** Lindl. EXPLORERS MANZANITA. Shrub 3 to 4 feet high, the erect stems with shreddy bark, several or many from a broad woody root-crown; branchlets pubescent or tomentulose, more or less glandular, very leafy; leaf-blades oblong-ovate, mostly acute, mostly truncatish at base, green and glabrous above, a fine tomentum or close felt-like pubescence beneath, ¾ to 1 (or 2) inches long; petioles short; panicle compact (¼ to ½ or 1 inch long), often reduced to a raceme; berry depressed-globose, glabrate or with scattered white hairs, 4 lines broad; nutlets distinct or some united, rugulose and somewhat ridged.

Sandy ridges or hills, 10 to 1000 feet: Santa Cruz Mts. (w. slope); northern Monterey coast line region; San Luis Obispo coast; Santa Cruz Isl.; south to the San Diego coast line in a varietal form. Jan.-Mar.

Tax. note.—Arctostaphylos tomentosa is common in the neighborhood of Monterey. The shrubs possess thick woody root-crowns from which sprouts arise after fire or mutilation. This species, first described as Arbutus tomentosa by Frederick Pursh, rests upon specimens gathered by Menzies on the "Northwest Coast." Menzies' specimens are in the Herbarium of the Natural History Museum, South Kensington, London. The particular sheet used by Pursh bears seven small branchlets of unequal size and represents a mixture of two forms, first, a form with tomentulose leaves, second, a form with stiffish-hirsute branchlets. The first form consists of two branchlets mounted diagonally across the sheet; they have the leaves finely tomentose beneath. The second form consists of five branchlets, the branchlets bearing long stiffish spreading hairs which arise from a dense tomentulum, the leaves acute or acutish at apex and base (at most obtuse or very obtuse at base), not tomentulose beneath but only puberulent, and subglabrate above. The two branchlets first spoken of correspond better on the whole, perhaps, than the other five branchlets, with Pursh's original description, which itself must have covered in part at least the two lots of specimens. The tomentose form matches in leaf shape and size and in tomentum very exactly Arctostaphylos vestita Eastw. of Monterey, a fact which has been previously pointed out by Alice Eastwood and C. V. Piper. The branchlets are quite densely white-tomentulose and there are no hirsute or long spreading hairs. The more well developed leaf-blades have a subcordate base (Jepson, Types and Original Citations, 1:68–71. 1926. ms.). Since Arctostaphylos vestita, in just the form in which it occurs at Monterey, does not exist elsewhere on the coast line of Pacific North America so far as known, it would seem likely that Menzies on one of his visits to Monterey between 1791 and 1795 collected his specimens of A. tomentosa at that point, not only the tomentose branchlets referred to above, but also the remaining five branchlets of the type sheet which are here regarded as variants of A. tomentosa, variants readily duplicated by latter day collections at Monterey. In that early day, moreover, the term "Northwest Coast" was used loosely and sometimes included northern California. It is of course possible that the specimens, although collected at Monterey, may have been mislabeled. Indeed many of Menzies' specimens were not labeled at all as to precise locality and are known only as belonging to the general collection made on the "Northwest Coast." According to the Northwest Coast portion of Menzies' Journal of Vancouver's Voyage, April to October, 1792, edited by C. F. Newcombe (Archives of British Columbia, Mem. 5:20,—1923), Menzies discovered a species of Arctostaphylos at Port Discovery on the present Washington coast. In so far as the evidence is now understood, it may be said that these Port Discovery specimens were not the ones used by Pursh. It may also be added that recent collections made at Port Discovery Bay, Clallam Co., Wash. (*Geo. Neville Jones*) show that the shrub of that locality (now referred to Arctostaphylos columbiana Piper) is quite different from the shrub at Monterey which was published as Arctostaphylos vestita Eastw.

Locs.—Santa Cruz Mts.: n. of Santa Cruz, *Jepson* 9779. Monterey Co.: Del Monte Heights, *Jepson* 5700; Monterey, *Jepson* 4004; Huckleberry Hill, *Cooper* 198. San Luis Obispo Co.: San Simeon, *K. Brandegee*. Santa Cruz Isl.: Pelican Bay (ridge above), *Jepson* 12,083 (branchlets weakly bristly).

Variation note.—Arctostaphylos tomentosa is an aggregate species exhibiting a swarm of varieties or forms chiefly marked by differences in hue of foliage and presence or absence on leaves or branchlets of two different kinds of trichomes, short soft hairs and bristly hairs, in various combinations and either non-glandular or glandular. Some of these forms which have received names are here noted: Shrubs having branchlets with bristly spreading often glandular hairs arising from a pubescence or indument with the leaves glabrous or merely puberulent, not tomentulose beneath, represent var. bracteosa Jepson (A. bracteosa Abrams).—Vicinity of Monterey: Del Monte Heights, *Jepson* 5701; Laguna Seca, *Cooper* 272. Between the typical form of A. tomentosa and the form A. tomentosa var. bracteosa there appear to be intermediates (Monterey, *Jepson* 2991; w. of the town, *Jepson* 5706). Shrubs having branchlets merely puberulent without bristly hairs and with glabrate leaves are A. bracteosa var. hebeclada Eastw. of Monterey. Shrubs of the San Diego coast line having branchlets and rachis without spreading hairs and with thick elliptic subglabrous leaves 8 to 12 lines long, represent A. tomentosa var. crassifolia Jepson.

Refs.—ARCTOSTAPHYLOS TOMENTOSA Lindl., Bot. Reg. t. 1791 (1836); Jepson, Man. 749 (1925). *Arbutus tomentosa* Pursh, Fl. 282 (1814), type loc. "Northwest Coast," *Menzies*. *Uva-ursi tomentosa* Abrams, Bull. N. Y. Bot. Gard. 6:433 (1910), in part. *Arctostaphylos vestita* Eastw.; Sargent, Trees and Shrubs, 1:205, pl. 97 (1905), type loc. Monterey (sandy plain between Hotel Del Monte and the shore), *T. Brandegee*. *Uva-ursi vestita* Abrams, N. Am. Fl. 29:98 (1914). *A. glandulosa* var. *vestita* Jepson, Madroño 1:86 (1922). *Andromeda bracteosa* DC. var. *hebeclada* DC., Prod. 7:607 (1839), type collected by *Douglas*, doubtless in Cal.; branchlets pubescent, not hirsute; leaves glabrate. *Arctostaphylos bracteosa* DC. var. *hebeclada* Eastw., Lflts. W. Bot. 1:122 (1934). Var. BRACTEOSA Jepson. *Andromeda bracteosa* DC., Prod. 7:607 (1839), type from "Nova California," *Douglas* (acc. Abrams, Lflts. W. Bot. 1:84), not "Drummond," who was never in Cal. *Arctostaphylos bracteosa* Abrams, Lflts. W. Bot. 1:84 (1934). Var. CRASSIFOLIA Jepson, Man. 749 (1925). *A. glandulosa* var. *crassifolia* Jepson, Madroño 1:86 (1922) type loc. Del Mar, *Jepson* 1606a.

20. **A. canescens** Eastw. GRAY MANZANITA. Low whitish shrub, 3 to 6 feet high; bark very dark or blackish; branchlets, peduncles and leaves minutely and closely white-pubescent or canescent, the leaves often glabrate in age; leaf-blades ovate to oblong or elliptic, rounded at apex or obscurely acute, ¾ to 3 inches long; pedicels short-hairy, non-glandular or sometimes slightly glandular, 2 to 4 lines long; bracts lanceolate, small, or the lower sometimes large (3 to 6 lines long); corolla white or pink; ovary woolly; berry depressed-globose, 4 lines broad, faintly pubescent with very short spreading hairs; nutlets distinct, narrow, ridged.

Dry rocky or clay slopes, 1500 to 4200 feet: Coast Ranges from Del Norte Co. to San Luis Obispo Co.; south to San Diego Co. Dec.-Apr.

Field note.—No statement is made in the original place of publication of Arctostaphylos canescens (1897) as to stump-sprouting, but the author of the species in 1934 (Lflts. W. Bot. 1:134) adds the highly valuable information that the shrubs are destroyed by fire and reproduce by numerous seedlings "which often bloom when only a few inches high." The value of this declaration is very great. Therefore, this very white shrub may in this additional manner be distinguished from Arctostaphylos glandulosa and all its forms, including the form called A. cushingiana. In the inner and middle North Coast Ranges the leaf-blades are most commonly broad and rounded, with longer petioles than the representation on Mt. Tamalpais.

Locs.—Ridge betw. Smith River and Elk Creek, Del Norte Co., *Tracy* 12,069; Hupa Mt., Humboldt Co., *Tracy* 7565; Iaqua Buttes, Kneeland Prairie, *Tracy* 4906; Asa Bean Ridge, near Castle Peak, ne. Mendocino Co., *Jepson* 14,694; Snow Mt., n. Lake Co., *M. S. Baker* 3115c; Cobb Mt., sw. Lake Co., *Jepson* 14,692; Mayacamas Range betw. Blue Lakes and Ukiah, *Jepson* 14,696; Mt. St. Helena, *Jepson* 14,695; Mt. Tamalpais, *Jepson* 6863; Loma Prieta, Santa Cruz Mts., *Elmer* 4251; Chorro Creek, San Luis Obispo Co., *Eastwood;* near Live Oak Sprs., se. San Diego Co., *Peirson* 7233.

Refs.—ARCTOSTAPHYLOS CANESCENS Eastw., Proc. Cal. Acad. ser. 3, 1:84 (1897), type loc. on trail from Eldridge grade to Larsens (Ridgecrest), betw. "last bunch of cypresses" and Rock Spr., Mt. Tamalpais, *Eastwood;* Jepson, Man. 749 (1925). *A. campbellae* Eastw., Lflts. W. Bot. 1:74 (1933), type loc. Mt. Hamilton, *Campbell*. *A. sonomensis* Eastw., l.c. 1:78 (1933), type loc. Rincon Ridge near Santa Rosa, *M. S. Baker* 3877c.

21. **A. columbiana** Piper. HAIRY MANZANITA. Erect shrub, 4 to 8 (or 12) feet high, arising from the ground by a single trunk; branchlets very leafy; branchlets and petioles with two kinds of pubescence, a short fine tomentum and long spreading stiffish hairs arising amongst it, the long hairs abundant and sometimes shaggy, or few and extremely scanty or scattered, usually not glandular or only slightly so; leaves pubescent or nearly glabrous, green or pale, the blades ovate to narrowly or broadly oblong, acute, obtuse to subcordate at base, entire or rarely spinulose-serrulate, margins and midribs sometimes hirsutulose, 1 to 2½ inches long; bracts linear-lanceolate, the lower or all foliaceous, ¼ to 1 inch long; pedicels

pubescent to almost glabrous, non-glandular; flowers white, in compact clusters; ovary densely pubescent, non-glandular; berry depressed, 3 to 4 lines in diameter, microscopically and sparingly white-hairy; nutlets distinct or more or less united, rugulose.

Wooded or brushy slopes, ridges and flats, 50 to 2500 feet: along the coast from Mendocino Co. to Del Norte Co. North to Washington. Feb.-Mar.

Field note.—Arctostaphylos columbiana keeps close to the coast line save that it is found rather generally through the main redwood belt from Mendocino Co. to Del Norte Co. At many stations it has been observed as to reaction to fire: it does not sprout from the root-crown. Charlotte M. Hoak also reports that settlers when clearing land on the Mendocino coast cut off this shrub a foot or two above the ground, leave the trunk for a year or two, and then dig it out, knowing that it will not stump-sprout. Seedlings are produced very freely.

The branchlets exhibit two kinds of trichomes, (a) a close or dense tomentulum, from which arise (b) long spreading usually stiffish hairs. These long hairs vary: sometimes they are moderate in number, sometimes so long and dense as to be shaggy (the form A. setosissima Eastw.), sometimes scanty and short (Lakeside, Ore., *Cooper* 135). Sometimes, though infrequently, the long hairs are more or less glandular (Ft. Bragg, *Mathews* 139; betw. Kennys and Usal, *Jepson* 2155). The form Arctostaphylos tracyi Eastw. of the central Humboldt coast needs special mention: the pubescence of the branchlets is fine and close, and the spreading hairs are scanty (Table Bluff, Humboldt Bay, *Tracy* 6168) or apparently none (Patrick's Pt., Humboldt Co., *Tracy* 6142); the old leaves are remarkably glabrate, as sometimes is the case with shrubs of A. columbiana on the Oregon coast.

Locs.—Fort Bragg, *Mathews* 139; Kennys sta., Mendocino north coast, *Jepson* 2155; Look Prairie, South Fork Eel River, *Constance* 638; Table Bluff, Humboldt Bay, *Tracy* 6169; Kneeland Prairie, *Tracy* 6606; Berry's ranch, Redwood Creek, n. Humboldt Co., *Jepson* 1953; Big Lagoon, n. Humboldt Co., *Jepson* 9410; betw. Camp Six and Gasquet, Del Norte Co., *M. S. Baker* 327.

Var. **virgata** (Eastw.) McMinn comb. n. Bolinas Manzanita. Erect shrub, 5 to 8 (or 14) feet high, rather densely leafy; branchlets, petioles and rachis puberulent and with short spreading glandular hairs or bristles, dark-colored; branchlets with the leaves ascending in close ranks, tending to embrace or half-conceal the panicle; leaf-blades ovate to oblong, acute at apex, acute or obtuse at base, dark green, their midribs and margins glandular-hairy when young, almost glabrous when mature, 1 to 2 inches long; petioles short; panicles very compact; bracts foliaceous; pedicels glandular-puberulent; corolla white; ovary densely covered with gland-tipped hairs; berry viscid.—Woods of cañon sides and ridges, 200 to 2000 feet: coastal Marin Co. from Mt. Tamalpais to Point Reyes Peninsula on either side of the San Andreas Fault. Jan.-Mar.

Field note.—Arctostaphylos columbiana var. virgata is associated with Sequoia sempervirens or grows in its forest borders. It also is found associated with Pinus muricata on the Point Reyes Peninsula which is destitute of Redwood. There is no evidence of root-crown sprouting in this species. The stem is commonly densely leafy just below the panicle in such a way that this bunch of leaves seems to stand above the down-curving panicle which is cylindrically compact and comparatively few-flowered. The general cast of the herbage is yellow-green. The leaves are thin and somewhat willow-like, and commonly very acute. The following stations validate it: Mt. Tamalpais (s. slope), *Geo. D. Allin;* Bolinas Ridge, *Jepson* 10,309; San Geronimo Ridge, *Ewan* 10,176; Inverness, *Jepson* 502a; Inverness Ridge, *Ewan* 9376.

Refs.—ARCOTOSTAPHYLOS COLUMBIANA Piper, Fl. Nw. Coast, 279 (1915), type loc. Union City, Mason Co., Wash., *Piper* 898; Jepson, Man. 749 (1925). *A. tomentosa* Jepson, Madroño 1:87 (1923), not Lindl. *A. setosissima* Eastw., Lflts. W. Bot. 1:78 (1933), type loc. Mendocino City, *Eastwood;* branchlets bristly as well as pubescent. *A. tracyi* Eastw., l.c. 1:79 (1933), type loc. Big Lagoon, Humboldt Co., *Tracy* 6141; branchlets puberulent, not bristly. Var. VIRGATA McMinn. *A. virgata* Eastw.; Sarg., Trees and Shrubs 1:203 (1905), type loc. "Mt. Tamalpais and the hills west of Tomales Bay; most abundant and characteristic at the lower part of the Bootjack trail on Mt. Tamalpais not far from Redwood Cañon," *Eastwood. A. glandulosa* var. *virgata* Jepson, Madroño 1:87 (1922), Man. 749 (1925).

22. **A. andersonii** Gray. Doctors Manzanita. (Fig. 299.) Erect shrub, 4 to 8 (or 14) feet high; branchlets with copious straight spreading hairs or bristles and with glandular indument; leaves crowded or almost imbricated on the branchlets, the blades oblong or ovate, cordate at base or even auriculate, rounded to lance-shaped at apex, entire or serrulate below the middle, puberulent or densely pubescent, or becoming glabrous, 1 to 2½ inches long, commonly sessile, or sometimes with a petiole 1 to 2 or 3 lines long; bracts mostly foliaceous, 2 to 6 lines long; pedicels glandular-puberulent; corolla 3 lines long; berry viscid-pubescent.

Clay or shaly slopes, 500 to 2000 feet: South Coast Ranges from the Oakland Hills to the Santa Cruz Mts. and the Santa Lucia Mts. Feb.

Biol. note.—The main stem or trunk of Arctostaphylos andersonii, as observed in the Oakland Hills, does not thicken at the ground and has not the capacity to sprout from the root-crown. In consequence the shrubs are killed outright by chaparral fires. Mutilation by the axe has similar results. Trunks 4 feet high have been noted which did not regenerate. In morphological characters it is a variable species. It is very variable in size and form of leaf and in character and degree of pubescence. This statement is especially true in its center of distribution, the Santa Cruz Mts. In these mountains also chances to be the locality (Ben Lomond) for the nomenclatorial type of the species. While the leaves are usually markedly cordate at base, sometimes they are merely subcordate or obtuse at base. Leaves obtuse at base and leaves subcordate at base may be found on one branchlet.

Locs.—Oakland Hills, *Jepson* 5715; Pilarcitos Lake, San Mateo Co., *Davy* 1049; Kings Mt., San Mateo Co., *C. F. Baker* 271; Mt. Madonna, s. Santa Cruz Mts., *Jepson* 9682; Pajaro Hills, *Chandler* 429; Sur ranch, Santa Lucia Mts., *Davy* 7408.

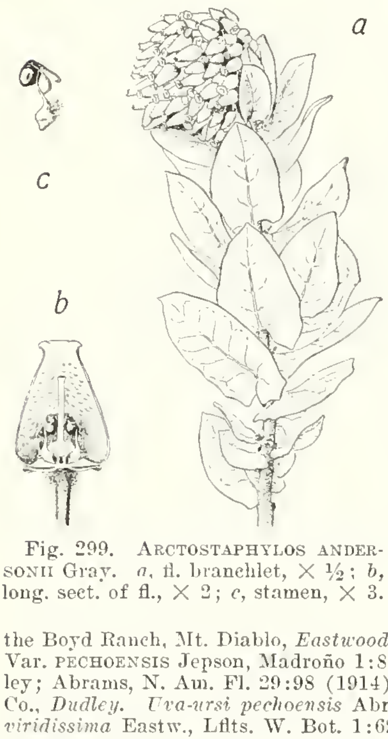

Fig. 299. Arctostaphylos andersonii Gray. *a*, fl. branchlet, × ½; *b*, long. sect. of fl., × 2; *c*, stamen, × 3.

Var. **auriculata** (Eastw.) Jepson. Leaves mostly ¾ to 1½ inches long, the blades elliptic, entire, cordate, sessile, usually canescent.—Mt. Diablo region: Antioch, *K. Brandegee*; Sycamore Creek (head of), *Jepson* 9662.

Var. **pechoensis** (Dudley) Jepson. Bishops Manzanita. Branchlets puberulent and bristly (as in the type collection) or merely tomentulose; leaf-blades ¾ to 1¼ inches long; pedicels mostly glabrous.—Near the San Luis Obispo coast: Cuesta Pass, Santa Lucia Mts.; San Simeon; Morro Bay.

Var. **viridissima** (Eastw.) Jepson comb. n. Leaf-blades bright green, auriculate at base or truncatish, subsessile, ¾ to 1 inch long; stems hairy.—Hills along the Santa Barbara coast (Lompoc; Pt. Sal); Santa Rosa Isl.; Santa Cruz Isl.; Santa Catalina Isl. (betw. Avalon and the Isthmus, *Wolf* 3626).

Refs.—Arctostaphylos andersonii Gray, Proc. Am. Acad. 11:83 (1876), type loc. Ben Lomond, Santa Cruz Mts., *Anderson*; Jepson, Fl. W. Mid. Cal. 371 (1901), ed. 2, 313 (1911), Man. 750, fig. 731 (1925). *Uva-ursi andersonii* Abrams, N. Am. Fl. 29:98 (1914). *A. imbricata* Eastw., Proc. Cal. Acad. ser. 4, 20:149 (1931), type loc. San Bruno Hills, *Campbell & Meiere*. *A. pallida* Eastw., Lflts. W. Bot. 1:77 (1933), type loc. Oakland Hills opposite East Oakland, *W. W. Carruth*. *A. regismontana* Eastw., Lflts. W. Bot. 1:77 (1933), type loc. Kings Mt., San Mateo Co., *Sutliffe*; corolla pink or white. Var. auriculata Jepson, Madroño 1:88 (1922); Jepson, Man. 750 (1925). *A. auriculata* Eastw., Bull. Torr. Club 32:202 (1905), type loc. trail above the Boyd Ranch, Mt. Diablo, *Eastwood*. *Uva-ursi auriculata* Abrams, N. Am. Fl. 29:98 (1914). Var. pechoensis Jepson, Madroño 1:89 (1923); Jepson, Man. 750 (1925). *A. pechoensis* Dudley; Abrams, N. Am. Fl. 29:98 (1914), type loc. head of Wild Cherry Cañon, San Luis Obispo Co., *Dudley*. *Uva-ursi pechoensis* Abrams, l.c. Var. viridissima Jepson. *A. pechoensis* var. *viridissima* Eastw., Lflts. W. Bot. 1:62 (1933), type loc. China Harbor, Santa Cruz Isl., *J. T. Howell* 6368. *A. confertiflora* Eastw., l.c. 1:122 (1934), type loc. Black Mt. (s. of), Santa Rosa Isl., *Ralph Hoffmann*.

23. **A. insularis** Greene. Island Manzanita. Shrub 6 to 10 (or 16) feet high; branchlets glandular-puberulent and with short spreading glandular bristles; leaf-blades ovate to elliptic or oblong, obtuse or rarely subacute at apex, mostly truncate at base, bright green, nearly glabrous, ¼ to 2 inches long; peduncles and rachises glandular-puberulent; pedicels bearing spreading glandular hairs; flowers in a large panicle of elongated racemes, leafy-bracteate at base; bracts small; sepals with scarious fimbriate gland-tipped margins; corolla white; ovary white-woolly; berry depressed-globose, yellowish-brown, nearly glabrous, 3 to 6 lines broad, 2 to 3 lines high; nutlets distinct, only slightly ridged.

Dry rocky slopes, 10 to 1000 feet: Santa Cruz and Santa Rosa islands. May-July.

Field note.—On the hill slopes near Pelican Bay, Santa Cruz Island, a number of large shrubs are noted: one 14 feet high has a trunk diameter of 1 foot; another individual 16 feet high has a crown 22 feet broad, the trunk at the ground is 2 feet in diameter but parted into several stems. Trunks 2 to 4 feet high before branching and 6 to 8 inches in diameter are, however, frequent. This species has the capacity to sprout from the root crown (Jepson Field Book, 45:192,—1927. ms.).

Locs.—Pelican Bay, Santa Cruz Isl., *Jepson* 12,102; Friar's Harbor, Santa Cruz Isl., *Peirson* 11,041; Santa Rosa Isl. (Zoe 1:141).

Refs.—ARCTOSTAPHYLOS INSULARIS Greene; Parry, Bull. Cal. Acad. 2:494 (1887), type loc. Santa Cruz Isl., *Greene;* Jepson, Man. 750 (1925). *A. insularis* var. *pubescens* Eastw., Lflts. W. Bot. 1:62 (1933), type loc. Santa Cruz Isl., *Greene;* bracts and ovary pubescent.

24. **A. drupacea** Mcbr. COAHUILA MANZANITA. Diffuse shrub 3 to 9 (or 15) feet high; branchlets and inflorescence glandular short-pilose and pubescent; leaf-blades elliptic, obtuse but abruptly mucronate, glaucous, puberulent (and sometimes glandular) or subglabrous, 1¼ to 2¼ inches long; petioles 2 to 4 lines long; pedicels and bracts pink; pedicels glandular-hairy, 6 to 7 lines long; bracts membranous, lanceolate, 2 to 4 lines long, deciduous; sepals whitish, glandular-ciliate; ovary glandular-pubescent; berry red, oval, 3 lines long, the surface rugose and glandular short-hairy; stone solid.

Mountain slopes and mesas, 2000 to 7500 feet: San Bernardino Mts. to the Cuyamaca Mts. South to Lower California. May-June.

Field note.—Arctostaphylos drupacea, as observed on the summit of Monument Peak, Laguna Mts., is noteworthy for its very large compact clusters of pink or rose-colored flowers which, when in full bloom, form a gorgeous sight. It may be considered one of the finest shrubs of the Southern California chaparral. When it goes into the fruiting stage, the berries are extremely sticky.—F. W. Peirson.

Locs.—Seven Oaks, San Bernardino Mts., *Parish* 3709; Mill Creek, e. end San Bernardino Valley, *Jepson* 5588; Strawberry Valley, Mt. San Jacinto, *Jepson* 1305; Hot Springs Mt., Warner Sprs., *Jepson* 8744; Cuyamaca Peak, *T. Brandegee.*

Refs.—ARCTOSTAPHYLOS DRUPACEA Mcbr., Contrib. Gray Herb. 53:16 (1918); Jepson, Man. 750 (1925). *A. pringlei* Parry var. *drupacea* Parry, Bull. Cal. Acad. 2:495 (1887), type loc. mts. e. of San Diego, *Orcutt* 543. *Uva-ursi drupacea* Abrams, Bull. N. Y. Bot. Gard. 6:434 (1910).

25. **A. bicolor** Gray. MISSION MANZANITA. Shrub 3 to 6 (or 10) feet high; leaves coriaceous, brittle, the blades oblong or elliptic, tapering to base and apex, tending to be revolute, dark green, shining and glabrous above, white-tomentose or felt-like beneath, 1 to 2½ inches long, not vertical; pedicels and calyx at first densely tomentose; pedicels short (1 to 2 lines long); calyx dark red; corolla rose-color, 4 lines long; ovary a little hairy at summit; berry reddish, eventually with smooth highly polished dark red or almost black surface, 3 to 3½ lines broad; style-base persistent as a sort of short beak or papilla; stone solid, smooth.

Dry slopes and mesas, 50 to 2000 feet: Santa Catalina Isl.; coastal Los Angeles Co.; central and western San Diego Co. South to Lower California. Dec.-Mar.

Locs.—Santa Catalina Isl., *Blanche Trask;* South Fork La Tuna Cañon, Verdugo Mts., *MacFadden & Ewan* 4182; Fallbrook, *Parish;* Lake Wohlford, Escondido, *C. V. Meyer* 681; San Diego, *Jepson* 6670; San Pasqual grade, *Jepson* 8506.

Refs.—ARCTOSTAPHYLOS BICOLOR Gray, Proc. Am. Acad. 7:366 (1868); Jepson, Man. 750 (1925). *Xylococcus bicolor* Nutt., Trans. Am. Phil. Soc. ser. 2, 8:259 (1843), type coll. by *Nuttall* at San Diego, not "Monterey." *A. clevelandii* Gray, Syn. Fl. N. Am. 2:29 (1878), type loc. Potrero, San Diego Co., *Cleveland.*

12. **VACCINIUM** L.

Shrubs or bushes, or on high mountain peaks or ridges, dwarfish or depressed woody plants. Leaves alternate. Flowers small (1 to 3 lines long). Calyx-tube adnate to the ovary, the limb 5-parted or -lobed, or entire. Corolla globular or urn-shaped to oblong-cylindric, 5 (or 4)-toothed, (4-parted in V. macrocarpon). Stamens 10 (or 8); anthers (except in V. ovatum and V. macrocarpon) bearing on the back two upwardly curved awns, in addition each cell prolonged at apex into a tube-like appendage opening at the tip by a pore. Ovary 4 or 5-celled, the cells several to many-seeded. Fruit a berry, crowned with the vestiges of the calyx-teeth.—Species about 100, all continents save Australia. (Classical Latin name of the bilberry.)

Foliage deciduous; flowers solitary (sometimes 2 or more in a cluster in nos. 2 and 3); filaments glabrous; anthers awned; herbage glabrous.—Subgenus EUVACCINIUM.
  Branchlets not strongly angled; berry blue or black (or at first red in no. 3).
    Calyx deeply 5-lobed or -parted; leaves entire; low plants.
      Leaves thin, only slightly veiny.......1. *V. occidentale.*
      Leaves thickish, reticulate-veiny.......2. *V. uliginosum.*
    Calyx entire (as if truncate) or nearly so; leaves serrulate.
      Plants 2 to 4 feet high; leaf-blades 1 to 2 inches long.......3. *V. membranaceum.*
      Plants low or dwarfish; leaf-blades mostly ½ to 1 inch long.......4. *V. caespitosum.*
  Branchlets strongly angled; berry red.
    Plants 3 to 12 feet tall; branchlets spreading; leaves entire.......5. *V. parvifolium.*
    Plants low or dwarfish; branchlets fastigiate; leaves serrulate.......6. *V. myrtillus.*
Foliage evergreen; flowers in lateral racemes; filaments hairy or puberulent; anthers awnless; branchlets and petioles pubescent, the leaves glabrous.—Subgenus VITIS-IDAEA.......7. *V. ovatum.*

1. **V. occidentale** Gray. WESTERN BLUEBERRY. (Fig. 300.) Low shrub (1½ to 3 feet high), with stoutish stems and numerous clustered and erect branchlets; leaf-blades obovate or obovate-oblong, glaucescent on the under surface, entire, ¼ to ¾ inch long; pedicels 1 to 4 lines long; flowers solitary or in clusters of 2; calyx 5-parted; corolla white, oblong-cylindric, 2 to 4 lines long, mostly 4-toothed; berry blue-black with a bloom, elliptic to oblong, 2½ to 4 lines in diameter, on a pendulous pedicel.

Swamps or wet meadows, 5000 to 8000 (or 10,900) feet: Sierra Nevada from Tulare Co. to eastern Siskiyou Co.; northern Humboldt Co. to western Siskiyou Co. East to Utah, north to Washington. June-July.

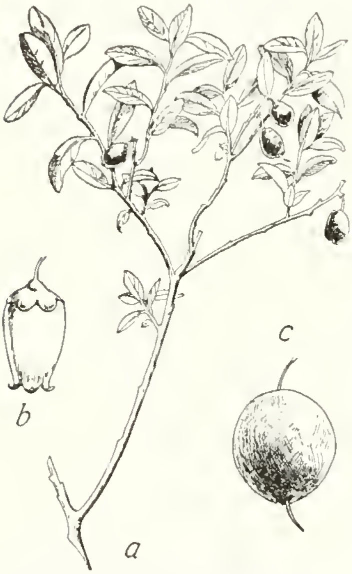

Fig. 300. VACCINIUM OCCIDENTALE Gray. *a*, fr. branchlet, × ½; *b*, fl., × 3; *c*, fr., × 2.

Locs.—Sierra Nevada: Sequoia Park, *Walter Fry* 47; Rock Creek lake basin, w. Inyo Co., *Peirson* 9480; Huntington Lake, *Jepson* 12,971; Harden Ranch, Tuolumne Co., *Jepson* 10,566; Dorrington, Calaveras Co., *Jepson* 10,188; Pioneer road sta., North Fork Yuba River, *Jepson* 16,845; Medicine Lake, Siskiyou Co., *M. S. Baker* 478. North Coast Ranges: Trinity Summit, n. Humboldt Co., *Tracy* 14,262; Sisson, Siskiyou Co., *Jepson* 14,689.

Refs.—VACCINIUM OCCIDENTALE Gray, Bot. Cal. 1:451 (1876), type from the Sierra Nevada, *Bolander*; Jepson, Fl. W. Mid. Cal. 374 (1901), ed. 2, 315 (1911), Man. 751 (1925).

2. **V. uliginosum** L. BOG BILBERRY. (Fig. 301.) Low shrub ½ to 2 feet high, freely branching; branchlets not angled; leaf-blades oval to cuneate-obovate, obtuse or abruptly short-acute, mostly crowded on the short branchlets, 2½ to 6 lines long, paler beneath, entire, thickish, reticulate-veiny (especially beneath); flowers solitary or in 2s; pedicels 1 to 2 (or 3) lines long; calyx deeply 5-parted; corolla pink, ovoid to globose, 3 to 4 lines long; berry large, blue, somewhat glaucous, 5 to 6 lines broad, borne on a drooping pedicel.

Sphagnum bogs, 20 feet: Humboldt Co. North to Alaska, east to New England and Labrador. Europe, Asia. July.

Geog. note.—Vaccinium uliginosum was discovered in California in 1924 by J. P. Tracy at Big Lagoon in Humboldt Co. (no. 6725). This is our only known station and is doubtless the southernmost station on the Pacific Coast and perhaps in North America. The leaves in the Humboldt shrub are mucronulate at apex and thus answer to var. mucronatum Herder, but such a variety seems inconsiderable, since in size, shape, reticulation and apex of leaves, the plant of

Big Lagoon does not differ in any essential manner from many Alaskan or north European (especially Scandinavian) plants representative of V. uliginosum, in which mucronulate or quite obtuse leaves are often found on one individual. Typical Vaccinium uliginosum, as it occurs at Iliuliuk, Unalaska, Aleutian Islands, has, sometimes, mucronulate and obtuse leaves on the same bush (*Jepson* 133). In Alaska the berries are an important article of food both to the Indians and the white settlers.

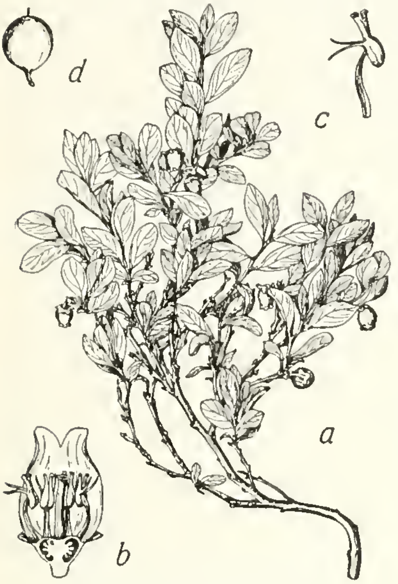

Fig. 301. Vaccinium uliginosum L. *a*, fl. branchlet, × ½; *b*, long. sect. of fl., × 3; *c*, stamen, × 5; *d*, fr., × ½.

Refs.—Vaccinium uliginosum L., Sp. Pl. 350 (1753), type from Sweden; Howell, Fl. Nw. Am. 411 (1901).

3. **V. membranaceum** Dougl. Thin-leaf Huckleberry. (Fig. 302.) Shrub 2 to 4 feet high, with widely spreading branches; branchlets slightly angled, those of the season bearing 3 to 5 (not crowded) leaves; leaf-blades ovate or obovate to oval, mostly acute or acuminate, finely serrulate, membranous, both sides nearly alike, 1 to 2 inches long; pedicels 3 to 5 lines long; calyx entire; corolla depressed-globose, greenish-white, 2 lines broad; pedicels erect in fruit; berry black or red (or at least red at first).

Mountain bogs, 5000 to 7000 feet: Humboldt, Del Norte, Siskiyou and Modoc Cos. North to British Columbia. May-June.

Locs.—Trinity Summit, n. Humboldt Co., *Davy* 5759; Knownothing Creek (head of), near Salmon Summit, *Tracy* 14,419; Bear Basin, e. Del Norte Co., *Ruby Van Deventer* 67; Haypress Mdw., Marble Mt. region, w. Siskiyou Co., *Chandler* 1577; Lassen Creek, Modoc Co., *L. S. Smith* 907.

Refs.—Vaccinium membranaceum Dougl.; Hook., Fl. Bor. Am. 2:32 (1834), type from the "Northwest Coast," *Menzies;* Jepson, Man. 752 (1925). *V. myrtilloides* var. *macrophyllum* Hook., l.c. *V. macrophyllum* Piper, Contrib. U.S. Nat. Herb. 11:443 (1906).

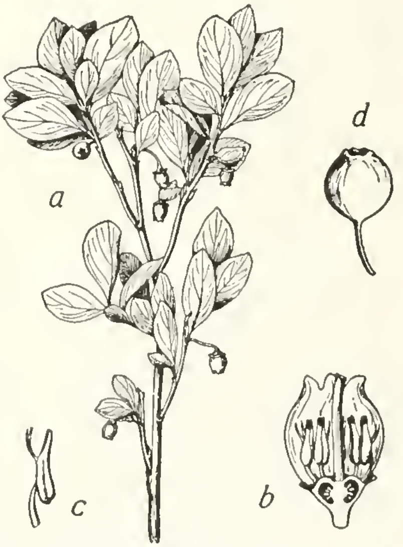

Fig. 302. Vaccinium membranaceum Dougl. *a*, flowering branch, × ½; *b*, long. sect. of fl., × 3; *c*, stamen, × 5; *d*, berry, × 1.

4. **V. caespitosum** Michx. Dwarf Bilberry. (Fig. 303.) Dwarfish, depressed, 2 to 4 inches high, or at lower altitudes to 9 inches high; branchlets not angled; herbage glabrous; leaf-blades obovate, mostly acute, usually cuneate at base, finely serrulate, ½ to ¾ (or 1¼) inches long; pedicels 1 to 2 lines long; calyx rim a wavy border or entire; corolla pendulous, pink or white, ovoid, mostly 5-toothed; berry blue with a bloom, globose, 2½ to 3½ lines in diameter, on a curved pedicel.

Montane wet meadows and rocky ridges: Sierra Nevada, 6500 to 11,600 feet, from Tulare Co. to Modoc Co.; high North Coast Ranges, 5000 to 7000 feet, from Humboldt and Trinity Cos. to Siskiyou Co.; along the coast (in wet meadows), 5 to 100 feet, from Humboldt Bay to Del Norte Co. North to Alaska, east to Colorado and New England. June-July.

Locs.—Sierra Nevada: Hockett Mdw., Tulare Co., *Jepson* 14,690; Evolution Basin, Fresno Co., *E. Ferguson* 483; Crescent Lake, Mariposa Co., *Congdon;* Mt. Dana, *Jepson* 3267; Cold Creek, Tuolumne River, *Jepson* 4492; Suzy Lake, Eldorado Co., *Ottley* 1143; Silver Lake, Lassen Co., *Baker & Nutting;* Mt. Shasta (N. Am. Fauna 16:158); Mt. Warren, Modoc Co., *Frances Payne* 723. North Coast Ranges: Humboldt Bay, *Chandler* 1181; Crescent City (2 mi. e.), *Tracy* 12,392; Cuddihy Valley, w. Siskiyou Co., *Jepson* 2851.

Var. **arbuscula** Gray. Thick-bushy and erect with red branches, 1½ to 2 feet high.—Mt. Shasta at lower altitudes than the species; Plumas Co.

Refs.—VACCINIUM CAESPITOSUM Michx., Fl. 1:234 (1803), type loc. Hudson's Bay, Canada; Jepson, Fl. W. Mid. Cal. ed. 2, 315 (1911), Man. 752 (1925). Var. ARBUSCULA Gray, Syn. Fl. 2:24 (1878), type from Plumas Co., *R. M. Austin. V. arbuscula* Merriam, N. Am. Fauna 16:159 (1899).

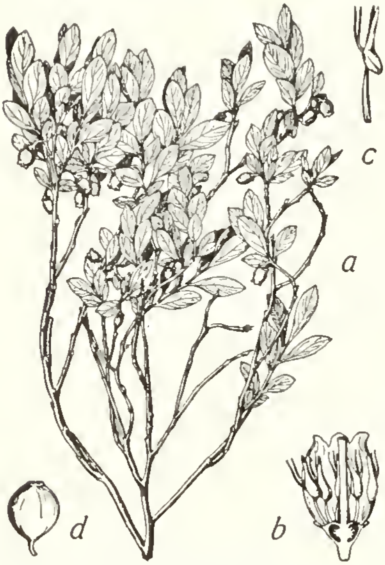

Fig. 303. VACCINIUM CAESPITOSUM Michx. *a*, flowering branch, × ½; *b*, long. sect. of fl., × 3; *c*, stamen, × 5; *d*, berry, × 1.

5. **V. parvifolium** Sm. RED HUCKLEBERRY. (Fig. 304.) Shrub 3 to 12 (or 25) feet high; branches and branchlets slender, very sharply angled, green, articulated; leaf-blades mostly oval, entire, mucronulate, thin, pale beneath, 5 to 8 or 12 lines long; pedicels 2 to 4 lines long, deflexed in fruit or sometimes curved; calyx slightly 5-lobed; corolla globular, greenish; berry bright red, somewhat translucent, 4 to 6 lines in diameter, pleasantly flavored.

Wooded slopes and flats and in wet places on serpentine: Coast Ranges, 100 to 4700 feet, from Santa Cruz Co. to Del Norte Co.; Sierra Nevada, 2500 to 5900 feet, from Madera Co. to Shasta Co. North to Alaska. Apr.-May. It is also called Coral Berry in Humboldt Co. (J. P. Tracy).

Locs.—Coast Ranges: Santa Cruz Co. (Anderson, Nat. Hist. Santa Cruz Co. 40); Butano Creek, San Mateo Co., *Elmer* 4924; Fort Ross, *H. P. Bracelin* 22; Brandon's Mill, Noyo, *Jepson* 17,835; Sherwood Valley, Mendocino Co., *Davy* 5159; Bull Creek, South Fork Eel River, *Constance* 759; Newell Camp, Kneeland Prairie road, Humboldt Co., *Tracy* 4879; betw. Korbel and Angels ranch, Humboldt Co., *Jepson* 1926; Horse Mtn., *Tracy* 8133; near Preston Peak, Siskiyou Mts., *Jepson* 2866; Camp Six, Middle Fork Smith River, Del Norte Co., *M. S. Baker*. Sierra Nevada: Fresno Big Trees, *Jepson* 15,972; Red Cloud Mine, Mariposa Co., *Congdon;* Rock Creek, Eldorado Co., *O. M. Evans;* Sugar Pine ranger sta., Placer Co., *L. S. Smith* 2542; Cow Creek Cañon, e. Shasta Co., *M. S. Baker*.

Refs.—VACCINIUM PARVIFOLIUM Sm., Rees' Cycl. 36:no. 3 (1819), type loc. "Northwest Coast," *Menzies;* Jepson, Fl. W. Mid. Cal. 373 (1901), ed. 2, 315 (1911), Man. 751 (1925).

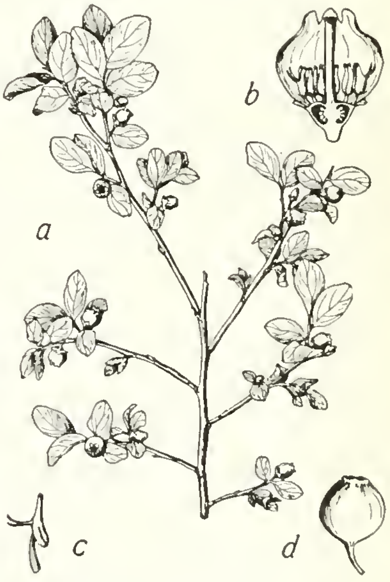

Fig. 304. VACCINIUM PARVIFOLIUM Sm. *a*, fl. branchlet, × ½; *b*, long. sect. of fl., × 3; *c*, stamen, × 5; *d*, fr., × 1.

6. **V. myrtillus** L. MOUNTAIN BILBERRY. (Fig. 305.) Stems freely branched, 3 to 10 inches high; branchlets angled, green, rather straight and disposed to be somewhat fastigiate; leaf-blades obovate to ovate, ½ to 1 inch long, serrulate or

almost entire; pedicels 1 to 2 (or 3) lines long; calyx-limb entire or very shallowly lobed; corolla ovoid or subglobose, its lobes more or less erosulate; berry red.

Montane, 6000 to 7000 feet: Siskiyou Co. (rare in California). North to Alaska. Europe.

Loc.—Marble Mt., *Chandler* 1617.

Refs.—Vaccinium myrtillus L., Sp. Pl. 349 (1753), type loc. European; Jepson, Man. 752 (1925). *V. myrtillus* var. *microphyllum* Hook., Fl. Bor. Am. 2:33 (1834), type loc. "Alpine woods near the Height of Land and Columbia Portage," n. Rocky Mts., *Drummond*. *V. scoparium* Leiberg, Mazama 1:196 (1897).

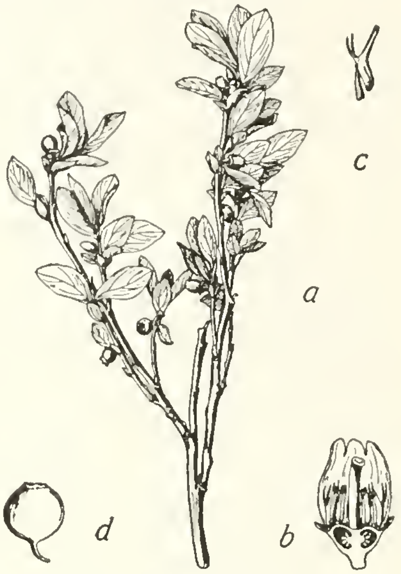

Fig. 305. Vaccinium myrtillus L. *a*, fl. branchlet, × ½; *b*, long. sect. of fl., × 3; *c*, stamen, × 5; *d*, fr., × 1.

7. **V. ovatum** Pursh. California Huckleberry. (Fig. 306.) Erect shrub 4 to 8 feet high; leaves coriaceous, shining above, the blades oblong-ovate, serrate, ½ to 1¼ inches long, short-petioled; racemes short and dense, 4 to 7 (or 9)-flowered, axillary and shorter than the leaves, often forming compact clusters; pedicels 2 to 3 lines long; corolla pink, broadly bell-shaped, 3 to 3½ lines long; berry black, without bloom, globose-ovoid, 3 to 4 lines long.

Hill slopes and cañon valleys, 10 to 2500 feet: San Diego Co. (rare); along the coast from Santa Barbara Co. to Del Norte Co., especially in the Redwood belt. North to British Columbia. Feb.-May.

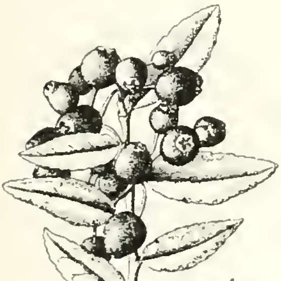

Fig. 306. Vaccinium ovatum Pursh. Fruiting branchlet, × ¾.

Field note.—As a Redwood associate, Vaccinium ovatum is extremely abundant as ground cover in the forest and is often a dominant. In Mendocino County it may take on an arborescent form and develop a trunk 5 to 7 inches in diameter. In logged Redwood lands it is commonly the first woody species to repopulate the area, but it is likely later to be overtopped by Ceanothus thyrsiflorus. If the crown of the shrub is cut off or fire-killed, Vaccinium ovatum usually stump-sprouts freely.

Locs.—Bottle Peak near Escondido, *C. V. Meyer;* upper Mission Cañon, Santa Barbara, *Tucker* 106; Santa Cruz Isl. (Zoe 1:141); Purisima Hills, Lompoc; Cerro Alto Mt. near San Luis Obispo, *Condit & Waters;* Monterey, *Jepson;* San Vicente Creek, Santa Cruz Co., *Jepson;* Kings Mt., San Mateo Co., *Elmer* 4561; Redwood Peak, Oakland Hills, *H. H. Haworth;* Olema, Marin Co., *Jepson* 14,687; Gualala, Mendocino Co., *Robt. Brandt;* Cahto, Mendocino Co., *Jepson* 14,688; Bull Creek, near Dyerville, *Jepson;* Eureka, *Tracy* 2017; Trinidad, Humboldt Co., *Geo. Parrish;* Crescent City, *Shockley;* Quartz Creek, Del Norte Co., *Jepson.*

Var. **saporosum** Jepson. Berry glaucous.—Monterey; Santa Cruz Co.; Mendocino Co. to Del Norte Co. (Patrick Creek, *C. B. Wolf* 1773). The berry ripens earlier than in the species and has a more agreeable flavor. In the Big Basin, Santa Cruz Mts., H. A. Dutton observes that the leaves are a darker green than in the species, that the berry is pear-shaped while it is globose in the species. On the Mendocino coast, says Charlotte M. Hoak, the shrubs with blue or glaucous berries are favored by school-children who call them blue-berries; the shrubs with non-glaucous black or purple berries are called huckleberries. The berries of the former are thin-skinned, mellow and sweet; the berries of the latter are tougher or thicker-skinned and carry a twangy taste. These two forms are not ecological; sun or shade, forest or cut-over lands do not alter their character. In Humboldt County J. P. Tracy has observed that black-berried bushes may have fruit as early, as large and as good-flavored as glaucous-fruited bushes growing beside them; but it is true that the glaucous berries are more generally large, tender and sweet.

Refs.—Vaccinium ovatum Pursh, Fl. 290 (1814), type loc. Columbia River, *Lewis;* Jepson, Fl. W. Mid. Cal. 373 (1901), ed. 2, 315 (1911), Man. 751, fig. 732 (1925). Var. saporosum Jepson, Man. 751 (1925), type loc. Gualala, Mendocino Co., *Robt. Brandt.*

Vaccinium macrocarpon Ait., Hort. Kew. ed. 2, 2:13, pl. 7 (1789). *Oxycoccus macrocarpus* Pursh, Fl. 263 (1814). American Cranberry. (Subgenus Oxycoccus.) Stems slender, ascending, simple or sparingly branched, 5 to 7 inches high, rather densely clothed with evergreen leaves; leaf-blades oblong, the margin revolute, green and shining above, whitened or pale below, 3 to 5 lines long; petioles ¼ line long; flowers 1 to 4 in a terminal cluster, borne on long filiform pedicels; corolla pink or pale rose-color, deeply 4-parted, the lobes lanceolate, reflexed; anthers exserted, awnless; berry globose, red, 4 to 5 lines in diameter.—Bogs or sphagnum swamps, Newfoundland to Arkansas. Also found (doubtless introduced) in a swamp (old hydraulic diggings) near North Columbia (1 mi. s.), Nevada Co., 3000 feet, *L. S. Smith* (det. by W. A. Dayton).

13. **CHIMAPHILA** Pursh. Pipsissewa

Low perennial evergreen suffrutescent plants. Leaves in irregular whorls or a little alternate, serrulate. Flowers white or pink, waxy, in a terminal naked corymb. Calyx 5-parted. Corolla rotate; petals 5, distinct, orbicular, concave, spreading. Stamens 10; filaments with a conspicuous roundish dilation. Stigma orbicular-peltate, crowning the very short style which is concealed in the umbilicate summit of the ovary. Capsule 5-celled, dehiscent from above downwards.—Species 5, North America, Europe and Asia. (Greek cheima, winter, and phileo, to love, the plants evergreen.)

Leaves oblanceolate, many; peduncles 3 to 6-flowered............1. *C. umbellata.*
Leaves ovate, few; peduncles 1 to 3-flowered............2. *C. menziesii.*

1. **C. umbellata** Bart. var. **occidentalis** Blake. Prince's Pine. Stems often simple, 6 to 10 or 12 inches high, bearing several clusters or whorls of leaves and a terminal 3 to 6-flowered peduncle; leaf-blades oblanceolate, varying to oblong, sharply serrulate from near the base, 1½ to 2½ inches long; petioles 1 to 3 lines long; flowers 3 lines broad, pinkish or flesh-color; filaments with a roundish dilation at base which is hairy on the margin only.

Pine woods or brushy slopes, 1000 to 6000 (or 9000) feet, rather common: San Jacinto and San Bernardino mountains; Sierra Nevada from Tuolumne Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges from Lake Co. to western Siskiyou Co. North to British Columbia, east to Colorado. June-Aug. In the Sierra Nevada this species is a rarity south of Eldorado Co.

Locs.—S. Cal.: Saunders Mdw., San Jacinto Mts., *C. V. Meyer* 451; South Fork Santa Ana River, San Bernardino Mts., *Peirson* 4964; Dollar Lake, San Bernardino Mts., *Peirson.* Sierra Nevada: "Big Oak Flat road" (probably Tuolumne Co.), *J. A. Ridgway;* Glen Alpine, Eldorado Co., *McGregor;* Pioneer road sta., North Fork Yuba River, *Jepson* 16,830; Rich Pt., Plumas Co., *Jepson* 10,634; Digger Creek, e. Shasta Co., *J. Grinnell:* Mt. Shasta, *Copeland* 432; Forestdale, sw. Modoc Co., *Nutting;* Lassen Creek, Warner Mts., *L. S. Smith* 162. North Coast Ranges: Mt. Sanhedrin, *Heller* 5935; Squaw Creek, South Fork Eel River, *Constance* 873; Kneeland Prairie, *Chesnut & Drew;* betw. Dyers ranch and Hawkins Bar, w. Trinity Co., *Jepson* 1989; betw. Salmon Forks and Salmon Summit, *Jepson* 2088; Sisson, Siskiyou Co., *Jepson* 14,654; Shackelford Creek, w. Siskiyou Co., *Butler* 58; Dunn Creek, ne. Del Norte Co., *Jepson* 18,528.

Refs.—Chimaphila umbellata Bart., Veg. Mat. Med. U. S. 1:17, t. 1 (1817); Nutt., Gen. 1:274 (1818). *Pyrola umbellata* L., Sp. Pl. 396 (1753), type from Europe. Var. occidentalis Blake, Rhod. 19:242 (1917). *C. occidentalis* Rydb., N. Am. Fl. 29:30 (1914), type loc. Pine Creek, near Farmington, Latah Co., Ida., *Sandberg, McDougal & Heller* 519. *C. umbellata* Jepson, Fl. W. Mid. Cal. 368 (1901), ed. 2, 309 (1911), Man. 736 (1925).

2. **C. menziesii** Spr. Western Pipsissewa. More or less branched from the base, 3 to 6 inches high; leaf-blades ovate, mostly acute, serrulate or entire, ¾ to

1½ inches long; petioles 1 to 3 lines long; peduncles 1 to 3-flowered; flowers whitish; filaments with a roundish dilation at the middle which is covered with short hairs on the back.

Pine and fir woods, plants scattered, probably never abundant, 2600 to 6500 feet: mountains of coastal Southern California; Sierra Nevada from Tulare Co. to Tehama and Modoc Cos.; North Coast Ranges from northern Napa Co. to northern Humboldt Co. North to British Columbia. June-July.

Locs.—S. Cal.: Palomar Mt., *Esther Hewlett* 23; Saunders Mdw., San Jacinto Mts., *C. V. Meyer* 687; Mill Creek Falls, San Bernardino Mts., *Parish* 2525; Icehouse Cañon, San Antonio Mts. Sierra Nevada: Round Mt., Kaweah River basin, *Hopping* 126; betw. Tehipite Valley and Gnat Mdw., *E. Ferguson* 533; Brightman Flat, Tuolumne Co., *A. L. Grant* 891; Georgetown, Eldorado Co., *M. A. Kelley;* Truckee, *Sonne;* Meadow Valley, Plumas Co., *Keck* 453; Mt. Turner, e. Tehama Co., *J. Grinnell;* Forestdale, sw. Modoc Co., *M. S. Baker.* North Coast Ranges: Mt. St. Helena, *Jepson* 14,655; Bartlett Mt., n. Lake Co., *Mabel Hazell;* Elk Mt., n. Lake Co., *Tracy* 2327; Bald Mt., Humboldt Co., *Davy* 5620; Trinity Summit, *Manning* 71.

Refs.—Chimaphila menziesii Spr., Sys. 2:317 (1825); Jepson, Fl. W. Mid. Cal. 368 (1901), ed. 2, 309 (1911), Man. 736 (1925). *Pyrola menziesii* R. Br.; D. Don, Mem. Werner. Soc. 5:245 (1824), type loc. Northwest Coast, N. Am., *Menzies.*

14. MONESES Salisb.

Perennial herb with a short decumbent leafy base which bears a solitary drooping flower on a slender scape. Leaves thin, in 1 to 3 whorls or opposite pairs. Calyx 5 (or 4)-parted. Petals 5 (or 4), rotate, distinct. Stamens 10 or 8. Stigma peltate, with 5 (or 4) narrow radiating lobes. Capsule 4 or 5-celled, loculicidal from the summit, its valves not cobwebby.—Species 1. (Greek monos, single, and esis, delight, the plant one-flowered.)

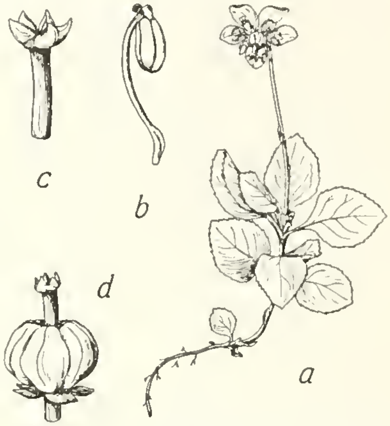

Fig. 307. Moneses uniflora Gray. *a*, habit, × ½; *b*, stamen, × 3; *c*, style and stigma, × 4; *d*, capsule, × 1½.

1. **M. uniflora** Gray. Forest Wintergreen. (Fig. 307.) Scape 2 to 5 inches high; leaf-blades roundish-ovate, serrate-dentate, reticulately veined, 4 to 9 lines long; petioles winged, 2 to 3 lines long; flower fragrant, 6 to 8 lines broad.

Cool forests, 500 to 3500 feet, very rare with us: Humboldt Co. to Siskiyou Co. North to Alaska, east to Labrador. Europe, Asia. May.

Locs.—Prairie Creek, Humboldt Co., *Tracy* 7515; Sisson, near Mt. Shasta, *Lemmon.* Alas.: Orca, *Jepson* 444.

Tax. note.—Our Pacific Coast plant, collected by Nuttall on the lower Columbia River in 1835, was first described as *Moneses reticulata* by Nuttall in 1843 and defined more recently as *Moneses uniflora* var. *reticulata* by Blake (Rhod. 17:28,—1915) by reason of its "more ovate less orbicular acute or acutish leaves serrate-dentate rather than crenate, characters by no means constant" and which are further weakened, especially as to outline, apex and reticulation of the leaves, by the series of Oregon and Washington specimens before us.

Refs.—Moneses uniflora Gray, Man. ed. 1, 273 (1848); Jepson, Man. 736 (1925). *Pyrola uniflora* L., Sp. Pl. 397 (1753), type European. *M. reticulata* Nutt., Trans. Am. Phil. Soc. ser. 2, 8:271 (1843), fir woods of the Columbia River not far from the sea, *Nuttall. M. uniflora* var. *reticulata* Blake, Rhod. 17:28 (1915).

15. PYROLA L. Wintergreen

Perennial herbs with slender rootstocks, basal evergreen leaves (rarely leafless), and leafless scapes. Flowers in a terminal raceme, 5-merous, mostly nodding Calyx 5-parted. Petals 5, distinct, concave or incurved, more or less converging. Stamens 10; filaments subulate, naked. Stigma 5-lobed or -toothed, on an elongated style. Capsule 5-celled, depressed-globose and 5-lobed, umbilicate at apex and base, dehiscent from the base upward; edges of the valves cobwebby when opening, persistent on the axis. Embryo minute.—Species 15, North America, Europe and Asia. (Diminutive of Pyrus, classical name of the Pear Tree, on account of resemblance in the leaves of one species.)

Stigma peltate, without ring or collar; style straight; flowers 2½ to 3 lines wide.
  Raceme not one-sided; style included; leaf-blades roundish........................1. *P. minor.*
  Raceme one-sided; style slightly exserted; leaf-blades ovate........................2. *P. secunda.*
Stigma 5-lobed, subtended by a distinct ring or collar; style curved, longer than the corolla, the apex upturned; flowers 4½ to 6 lines wide.
  Plants with green leaves.
    Flowers pink or red; leaves thin..3. *P. asarifolia.*
    Flowers white or whitish to brownish; leaves coriaceous.
      Leaves white-veined..................4. *P. picta.*
      Leaves not white-veined ....5. *P. dentata.*
  Plants with few leaves or with reduced (scale-like) leaves or at times leafless or apparently so. 6. *P. aphylla.*

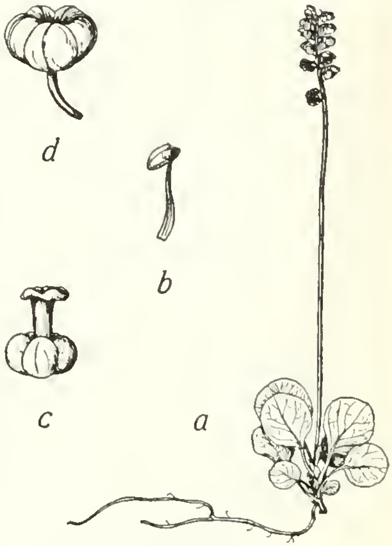

Fig. 308. Pyrola minor L. *a*, habit, × ⅓; *b*, stamen, × 4; *c*, pistil, × 3; *d*, capsule, × 4.

1. **P. minor** L. English Wintergreen. (Fig. 308.) Scapes 5 to 9 inches high; leaf-blades round to oval, minutely serrulate, thin, ½ to 1¼ inches long, the margined petiole mostly shorter; raceme ¾ to 1 inch long; corolla globose, white or rose-color.

High montane, 7000 to 10,000 feet: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Modoc Co. North America, Europe and Asia. Rare in California. July-Aug.

Locs.—S. Cal.: Round Valley, San Jacinto Mts., *Munz* 6395; South Fork Santa Ana River, San Bernardino Mts., *Munz* 6189. Sierra Nevada: Junction Mdw., Kern Cañon, *Jepson* 5025; Big Mdws., Bubb's Creek, Fresno Co., *S. W. Austin* 631; Palisade Creek, Middle Fork Kings River, *E. Ferguson* 520; Home Camp Creek, Huntington Lake, *A. L. Grant* 1418; Lassen Creek, Modoc Co., *R. M. Austin* 142.

Refs.—Pyrola minor L., Sp. Pl. 396 (1753), type European; Jepson, Man. 737 (1925).

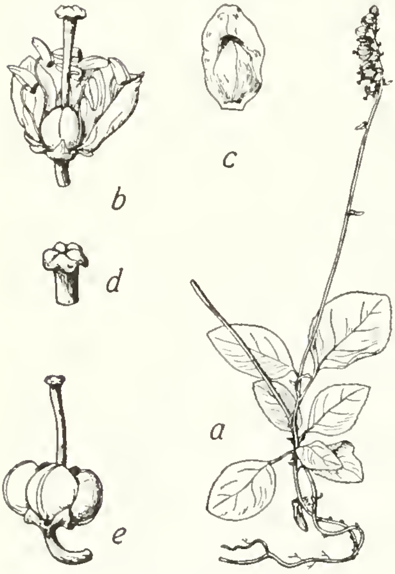

Fig. 309. Pyrola secunda L. *a*, habit, × ½; *b*, fl., with 2 petals removed on one side, × 3; *c*, petal, × 3; *d*, stigma, × 4; *e*, fr., × 3.

2. **P. secunda** L. One-side Wintergreen. (Fig. 309.) Scapes 5 to 9 inches high; leaf-blades ovate, minutely serrulate, thin and green, ½ to 1¾ inches long, the margined petiole shorter than the blade; raceme one-sided, dense, ⅝ to 1 inch long; petals white, with two tubercles at base inside.

Montane pine woods, 4500 to 7800 (or 10,500) feet: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Modoc Co.; Humboldt Co. to Siskiyou Co. North to Alaska, east to Maryland. Europe. Asia. July.

Locs.—S. Cal.: Round Valley, San Jacinto Mts.; Lost Cañon, upper Santa Ana River, San Bernardino Mts., *Peirson*. Sierra Nevada: Huckleberry Mdw., Giant Forest, *Newlon* 19; Heart Lake, Rock Creek lake basin, w. Inyo Co., *Peirson* 11,294; betw. Silver Pass and Fish Valley, Fresno Co., *A. L. Grant* 1554; Shadow Lake, Madera Co., *A. L. Grant* 1571; Kennedy Mdw., South Fork Relief Creek, Stanislaus River, *A. L. Grant;* Glen Alpine, Lake Tahoe, *Chesnut & Drew;* Donner Lake, *Sonne* 209; Lassen Creek, Warner Mts., *L. S. Smith* 161; Forestdale, Modoc Co., *Nutting;* Medicine Lake, Siskiyou Co., *M. S. Baker* 131. North Coast Ranges: South Fork Mt., Humboldt Co., *Chesnut & Drew;* Trinity Summit, *Tracy* 10,737; Shackelford Creek (head of), w. Siskiyou Co., *Butler* 57; Poker Flat, ne. Del Norte Co., *R. Van Deventer* 210.

Refs.—PYROLA SECUNDA L., Sp. Pl. 396 (1753), type European; Jepson, Fl. W. Mid. Cal. 368 (1901), ed. 2, 310 (1911), Man. 737 (1925).

3. **P. asarifolia** Michx. var. **incarnata** Fer. NORTHERN SHIN-LEAF. (Fig. 310.) Scapes 9 to 18 inches high, a single scaly bract borne at the middle; leaf-blades thin, orbicular, cordate to rounded at base, rounded at apex or rarely subacute, entire to finely crenate or serrulate, 1 to 3¼ inches long, the petioles as long; raceme loose, scaly-bracted, 2 to 6 inches long; corolla pink or red, drying rose-purple.

Pine woods: San Bernardino Mts., 8000 feet; Sierra Nevada, 4000 to 8200 feet, from Tulare Co. to Modoc Co.; Siskiyou Co., 4000 to 6000 feet. North to Alaska, east to New England. July-Aug.

Locs.—S. Cal.: Vivian Creek, San Bernardino Mts., *Munz* 7593. Sierra Nevada: Whitney Mdws., Tulare Co., *Purpus* 1895; Simpson Mdw., Middle Fork Kings River, *H. M. Eliot;* Mirror Lake, Yosemite, *Jepson* 3126; Colby, Butte Co., *R. M. Austin;* Forestdale, sw. Modoc Co., *M. S. Baker*. Siskiyou Co.: Mt. Shasta, *Jepson* 14,665; Castle Lake, *Alexander & Kellogg* 342.

Var. **bracteata** (Hook.) Jepson comb. n. Leaves elliptic-ovate, shortly acute, coriaceous, shiny, 2 to 3 inches long; flowers bright rose-pink.—Moist woods, outer North Coast Range from Mendocino Co. to Siskiyou Co. North to British Columbia.

Locs.—Noyo, Mendocino Co., *Bolander* 6542; divide betw. Cow Creek and Bear Creek, South Fork Eel River, *Constance* 835; Redwood House road, Humboldt Co., *M. S. Baker* 63; Eureka, *Tracy* 1191; Kneeland Prairie, *Tracy* 248; Bald Mt. betw. High Prairie and Snow Camp, Humboldt Co., *Tracy* 4552.

Refs.—PYROLA ASARIFOLIA Michx., Fl. 1:251 (1803). Var. INCARNATA Fer., Rhod. 6:178 (1904); Jepson, Man. 737 (1925). *P. rotundifolia* var. *incarnata* DC., Prod. 7:773 (1839), type loc. Dahuria. *P. incarnata* Fisch.; DC., l.c. *P. uliginosa* T. & G.; Torr., Fl. New York 1:453, t. 69 (1843), type loc. Oriskany, Oneida Co., N. Y., *Knieskern*. *P. rotundifolia* var. *uliginosa* Gray, Man. ed. 2, 259 (1856). Var. BRACTEATA Jepson. *P. bracteata* Hook., Fl. Bor. Am. 2:47 (1834), type loc. Northwest Coast, *Scouler*. *P. rotundifolia* var. *bracteata* Gray; B. & W., Bot. Cal. 1:460 (1876).

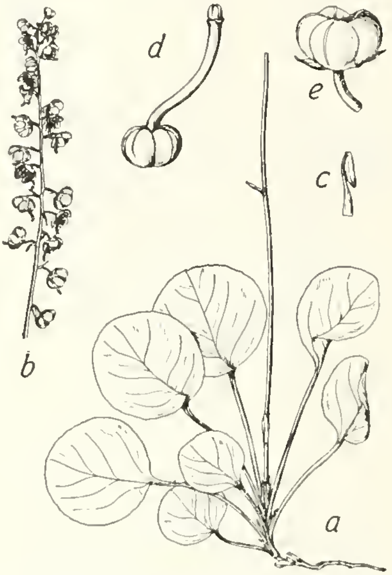

Fig. 310. PYROLA ASARIFOLIA Michx. var. INCARNATA Fer. *a*. base of plant, × ¼; *b*, infl., × ¼; *c*, stamen, × 1½; *d*, pistil, × 3; *e*, capsule, × 1½.

4. **P. picta** Sm. WHITE-VEIN SHIN-LEAF. (Fig. 311.) Scapes 8 to 15 inches high; leaf-blades ovate to elliptic, very coriaceous, mottled or veined with white, entire or serrulate, 1 to 3 inches long, the narrowly winged petiole mostly shorter than the blade; raceme 3 to 5 inches long; calyx-lobes broadly ovate, usually acute; corolla greenish-white.

Humus or sandy soil of pine and fir forests, 4000 to 9200 feet: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Mt. Shasta and Modoc Co.; North Coast Ranges from Lake Co. to Siskiyou Co. North to British Columbia, east to Wyoming. July-Aug.

Locs.—S. Cal.: Dark Cañon, San Jacinto Mts., *Hall;* Dollar Lake, San Bernardino Mts., *Munz* 6226. Sierra Nevada: Giant Forest, Tulare Co., *Newlon* 61; Dinkey Mdw., Fresno Co., *Jepson* 16,022; Huntington Lake, *A. L. Grant* 1156; Dorrington, Calaveras Co., *Jepson* 10,048; Pioneer sta., Sierra Co., *Jepson* 16,829; Truckee, *Sonne* 210; Meadow Valley, Plumas Co., *Fritz & Harris;* Milford, Lassen Co., *M. S. Baker;* Forestdale, sw. Modoc Co., *M. S. Baker* 536; Cedar Spr., Mt. Shasta, *Jepson* 14,660. North Coast Ranges: Elk Mt., Lake Co., *Tracy* 2331; Castle Peak, ne. Mendocino Co., *Jepson* 14,661; South Fork Mt., Humboldt Co., *Tracy* 9033; Trinity Summit, *Tracy* 10,569; Summerville, sw. Siskiyou Co., *Jepson* 2084; Dunn Creek, ne. Del Norte Co., *Jepson* 18,525.

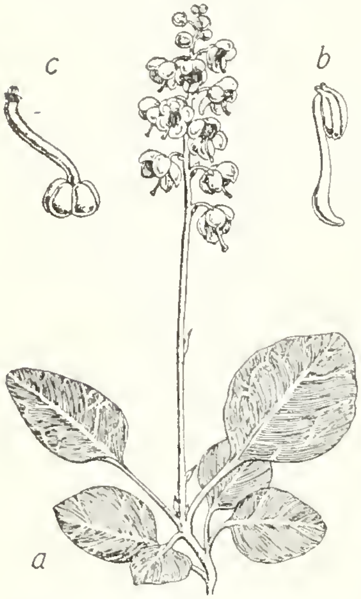

Fig. 311. Pyrola picta Sm. *a*, habit, × ⅜; *b*, stamen, × 2½; *c*, pistil, × 2.

Refs.—Pyrola picta Sm., Rees' Cycl. 29: Pyrola no. 8 (1819), type loc. Northwest Coast, *Menzies;* Jepson, Fl. W. Mid. Cal. 368 (1901), ed. 2, 310 (1911), Man. 737, fig. 718 (1925).

5. **P. dentata** Sm. Nootka Wintergreen. (Fig. 312.) Plants 4 to 9 inches high; leaf-blades ovate to obovate, coriaceous, serrate, often pale or glaucous, 1 to 2 inches long; raceme 1 to 3 inches long; petals cream-color.

Pine woods, 200 to 5000 feet: Mendocino Co. to Humboldt Co.; Sierra Nevada from Plumas Co. to Modoc Co. North to British Columbia. June.

Locs.—North Coast Ranges: Fort Bragg, *W. C. Mathews* 18; South Fork Mt., Humboldt Co., *Chesnut & Drew;* Hupa Mt., Humboldt Co., *Tracy* 7564; Brannan Mt., Humboldt Co., *Tracy* 3437; Twin Valley, Del Norte Co., *R. Van Deventer* 212. Sierra Nevada: Rich Pt., Plumas Co., *Jepson* 10,633; Chico Mdws., Butte Co., *Heller* 11,597; Silver Lake, Lassen Co., *Nutting;* Forestdale, Modoc Co., *M. S. Baker.*

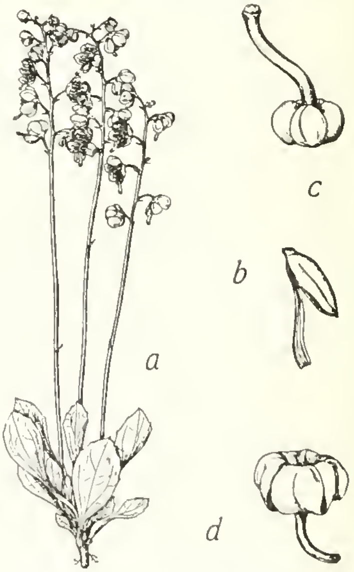

Fig. 312. Pyrola dentata Sm. *a*, habit, × ⅓; *b*, stamen, × 3; *c*, pistil, × 4; *d*, capsule, × 2.

Var. **integra** Gray. Leaves entire, glaucous, often blue-glaucous beneath.—Montane pine woods, 5000 to 9000 feet: San Bernardino and San Gabriel mountains; Sierra Nevada from Tulare Co. to Modoc Co. and Mt. Shasta; Humboldt Co. to western Siskiyou Co. North to Washington.

Locs.—S. Cal.: Whitewater River (head of), Mt. San Gorgonio, *C. M. Wilder* 1118; Coldwater Cañon, San Gabriel Mts., *Peirson* 519a; Prairie Fork, San Gabriel River, *Peirson* 2512. Sierra Nevada: betw. Shotgun Creek and Farewell Gap, *Jepson* 1003; betw. Tehipite Valley and Gnat Mdw., *E. Ferguson* 531; Huntington Lake, *A. L. Grant* 1098; betw. Graveyard Mdw. and Silver Pass, Fresno Co., *A. L. Grant* 1514; Eagle Mdw., South Fork of Middle Stanislaus River, *A. L. Grant* 376; Cascade Lake, near Fallen Leaf, *Ottley* 1192; Truckee, *Sonne* 210a; Lassen Peak, *Lemmon;* Silver Lake, Lassen Co., *Nutting;* Lassen Creek, Warner Mts., *L. S. Smith* 161; Mt. Shasta, *Condit.* North Coast Ranges: Hupa Mt., n. Humboldt Co., *Davy* 5644; Salmon Summit, *Tracy* 14,356; Humbug Mt., Siskiyou Co., *Butler* 1574.

Refs.—Pyrola dentata Sm., Rees' Cycl. 29: Pyrola no. 6 (1814), type loc. Nootka, Vancouver Isl., *Menzies;* Jepson, Man. 737 (1925). *P. picta* var. *dentata* Piper, Contrib. U. S. Nat. Herb. 11:434 (1906). Var. integra Gray, Pac. R. Rep 12^2:54 (1860), type loc. "high wooded hills east of Mt. Adams," Wash., *Cooper.* *P. pallida* Greene, Pitt. 4:39 (1899), type loc. Yreka, "northern California" (the region first cited), *Greene* 933.

6. **P. aphylla** Sm. RED CANKER. Scapes red, often many and clustered, from a scaly-bracted rootstock, 9 to 12 (or 16) inches high; leaves few or scale-like or at times apparently none; raceme (2½ or) 4 to 7 inches long; calyx red; petals obovate or elliptic, whitish or flesh-color; capsule 3 lines broad.

Wooded mountains, 100 to 8000 feet: mountains of coastal Southern California; Sierra Nevada from Fresno Co. to eastern Siskiyou Co.; Coast Ranges from Santa Cruz Co. to western Siskiyou Co. North to British Columbia. June-July.

Biol. note.—Ordinary or imperfect specimens of Pyrola aphylla, as found in herbaria, are so often leafless that this species has been regarded by various authors as a parasite or a saprophyte. Expanded green leaves are, however, not infrequently borne at the base of the flowering scape (Kneeland Prairie, Humboldt Co., *Tracy* 3047). Terminal rosettes of foliaceous leaves are produced also on sterile shoots of the season (Long Gulch, Yreka, *Butler* 38). It is probably true that flowering shoots of a season always arise from the terminal bud of the sterile shoots of the preceding season. Long ago, Theodore Holm demonstrated, chiefly on anatomical grounds, that Pyrola aphylla is an autophyte, and neither a parasite nor saprophyte (Bot. Gaz. 25:246–254, pl. 17,—1898). He also emphasized the significance of the large number of scale leaves which are produced.

Pyrola aphylla is not known east of the Sierra Nevada, but it occurs in that portion of the Sierra Nevada range which lies in western Nevada, namely the east side of Lake Tahoe.

On Nov. 18, 1936, Jos. P. Tracy writes from Humboldt Co.: "Pyrola aphylla, picta and dentata are closely allied species. Specimens of these species bearing small leaves require some notice. I have plants of undoubted P. picta with small reduced but still round and spotted leaves. I have other plants that I would refer to P. aphylla, although they possess small leaves shaped like those of P. dentata or its var. integra. The habitat of these three species is similar, and all occur sporadically, that is, never in extensive colonies, but only a small clump here and there, spaced often as widely as one hundred feet" (Jepson Corr. 39:868. ms.).

The flowers of Pyrola aphylla and P. picta, as observed on plants at Dorrington, Calaveras Co., resemble each other closely: in P. aphylla the flowers are 3½ to 4 lines long, on pedicels 3 to 3¼ lines long, the corolla is white or greenish or sometimes pinkish, the upper pair of petals closely approximate above the anther mass with the tips incurving so as to make a sort of hood; in P. picta the flowers are 5 lines long, on pedicels 1¾ to 3 lines long, the corolla is brown-pink, the upper pair of petals spreading loosely above the stamen mass or only slightly approximate.

Locs.—S. Cal.: Cuyamaca Mts., *Stokes;* Palomar Mt., *Esther Hewlett* 15; San Jacinto Mts., *Condit;* Bluff Lake, San Bernardino Mts., *J. Grinnell.* Sierra Nevada: Pine Ridge, Fresno Co., *Hall & Chandler* 583; Mariposa Big Trees, *Bolander* 4979; Confidence, Tuolumne Co., *Jepson* 7694; Dorrington, Calaveras Co., *Jepson* 10,075; Milford, Lassen Co., *M. S. Baker;* ne. Shasta Co., *M. S. Baker;* Mt. Shasta, *Brewer* 1411. Coast Ranges: Big Basin, Santa Cruz Mts., acc. *C. A. Reed;* Pescadero, San Mateo Co., *Elmer* 4297; Bear Valley, Marin Co., *G. Syme;* betw. Guerneville and Monte Rio, lower Russian River, *E. Ferguson* 230; Mt. St. Helena, *Jepson* 14,644; Signal Ridge, Yorkville, Mendocino Co., *W. W. Carruth;* Bull Creek, South Fork Eel River, *Constance* 792; betw. Willow Creek and Hupa, *Jepson* 2023; betw. Dyers ranch and Hawkins Bar, w. Trinity Co., *Jepson* 1998; Humbug Mt., Siskiyou Co., *Butler* 1575.

Refs.—PYROLA APHYLLA Sm., Rees' Cycl. 29: Pyrola no. 7 (1814), type from "west coast of North America" (Nootka Sound, acc. D. Don, Gard. Dict. 3:864), *Menzies;* Jepson, Fl. W. Mid. Cal. 368 (1901), ed. 2, 310 (1911), Man. 737 (1925).

16. ALLOTROPA T. & G.

Fleshy saprophytic perennial herb. Stems bright red with longitudinal white stripes in sharp contrast, densely clothed with scales at base and with scattered scales above. Flowers brownish-red in a dense spike-like raceme. Calyx of 5 sepals. Corolla none. Stamens 10, or at summit of spike 8; anthers short and thick, somewhat 2-lobed, apiculate at apex, turned inward and downward on the apex of the filament and thus somewhat pendulous, each cell opening by a chink on the back which reaches from the base to the middle. Ovary globose, 5-celled; style short; stigma peltate-capitate, shallowly 5-lobed.—Species 1. (Greek allos, different, and tropos, turned, the raceme not nodding as in Monotropa.)

1. **A. virgata** T. & G. SUGAR STICK. Plants ½ to 2 feet high; raceme virgate, mostly 6 to 9 inches long; scales of the stem often bluish-white; flowers 2½ to 3 lines long, on pedicels 1 line long; sepals rhomboidal or ovate, thin, whitish, shorter than the red or purple-black stamens; ovary dark red or purple-black, the style white.

Montane, under pines and firs: Sierra Nevada, 6000 to 8700 feet, from Tulare Co. to Siskiyou Co.; North Coast Ranges, 2000 to 7000 feet, from Sonoma Co. to Del Norte Co. North to Washington. June-July.

Locs.—Sierra Nevada: Giant Forest, *Newlon* 43; Kaiser Ridge, *Jepson* 13,257; Porcupine Flat, Yosemite, *Hutchinson & LeConte;* Philips sta., Eldorado Co., *C. W. Cadle;* Cascade Lake, near Lake Tahoe, *Newlon;* Tinkers Knob, Placer Co., *Sonne* 437; Mt. Shasta, *Jepson* 14,651. North Coast Ranges: Annapolis, Sonoma Co. (Madroño 4:138); Signal Ridge near Yorkville, *W. W. Carruth;* Soldier Ridge, se. Trinity Co., *Jepson* 14,652; Trinity Summit, *Jepson* 2117; Marble Mt., *Chandler* 1546; Quartz Creek to Jones Creek, Del Norte Co., *Jepson* 2892.

Refs.—ALLOTROPA VIRGATA T. & G., Pac. R. Rep. 6^3:80 (1857), type loc. Cascade Mts., Ore., *Pickering & Brackenridge;* Jepson, Fl. W. Mid. Cal. 367 (1901), ed. 2, 310 (1911), Man. 738 (1925).

17. MONOTROPA L.

Glabrous waxy-white herbs which turn black on drying. Stems scape-like, scaly, springing in a cluster from a ball of matted roots and ending in a solitary nodding flower. Sepals 2 to 4, scale-like or bract-like, deciduous. Petals 5 or 6, distinct, oblong, dilated a little at apex, erect, tardily deciduous. Stamens twice as many as the petals; anthers somewhat reniform, opening at first by two transverse chinks, at length 2-valved, the valves almost equal and spreading. Ovary 10-grooved, 5-celled; style short, thick; stigma funnelform, naked, obscurely crenate. Disk at base of ovary with 8 to 12 slender deflexed teeth. Seeds numerous, minute.—Species 3, North and South America and Asia. (Greek mono, one, and tropos, turned, the flower drooping.)

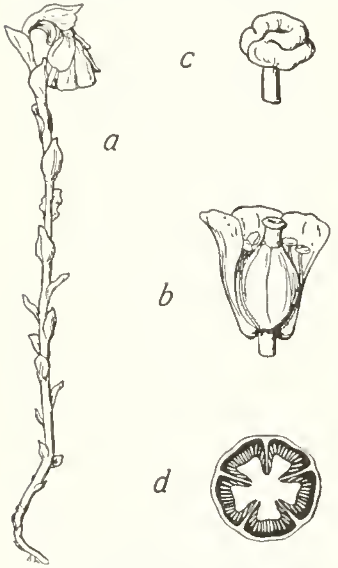

Fig. 313. MONOTROPA UNIFLORA L. *a*, habit, × ½; *b*, long. sect. of fl., × 1; *c*, anther, × 7; *d*, cross sect. of ovary, × 1½.

1. **M. uniflora** L. INDIAN PIPE. (Fig. 313.) Stem 4 to 7 inches high; flower 8 to 10 lines long; petals saccate at base, the teeth of the disk projecting into the sacs.

Dark damp woods, 100 to 2000 feet: Del Norte Co. North to Alaska, east to Newfoundland and Florida; Mexico. Asia. July-Aug.

Geog. note.—While by no means common, Monotropa uniflora is widely distributed almost throughout the United States except in arid regions. In California it has been found only in Del Norte Co., where it grows in deep Redwood forests: betw. Fort Dick and Bear Creek, *Ruby Van Deventer;* divide betw. Mill Creek and Wilson Creek, acc. *E. Fritz.* The cluster of young stems when first starting to grow from the matted underground ball presents a markedly fungoid aspect.

Refs.—MONOTROPA UNIFLORA L., Sp. Pl. 387 (1753), "Marilandia, Virginia, Canada"; Jepson, Man. 738 (1925).

18. HYPOPITYS Hill

White, yellowish or reddish saprophytic herbs with scaly simple stems arising from a ball-like cluster of matted fibrous roots. Raceme several to many-flowered, at first nodding, soon erect. Flowers yellowish-white or -red, mostly 3 or 4-merous, the terminal usually 5-merous. Sepals 2 and lateral, or a third one in front, or a fourth behind. Petals 3, 4 or 5, distinct, each bearing a gibbous nectary on each side at base. Stamens 6 to 10; filaments pubescent; anthers reniform, the cells confluent, opening by 2 valves. Ovary 4 to 7-celled; style columnar, expanding at summit into an umbilicate stigma. Disk with 8 to 12 short deflexed teeth. Capsule ovate-globose, the placentae covered with numerous minute seeds.—Species about 3, North America, Europe and Asia. (Greek hypo, beneath, and pitus, fir, on account of the habitat.)

1. **H. lanuginosa** Nutt. PINE-SAP. Stem fleshy, white or yellowish-red, minutely pubescent, 4 to 10 inches high; scales and bracts ovate-lanceolate, entire or slightly erose, imbricated below, scattered above; raceme rather dense; flowers white; calyx and corolla hairy inside; style densely hairy below the stigma; ovary 4 or 5-celled.

Deep humus of forests, 1000 to 4000 feet: Mendocino Co. to Siskiyou Co. North to Canada, east to New England and Florida. June-Aug.

Locs.—Mt. Sanhedrin, *Hall* 9483; betw. Acorn and Green Point ranch, Humboldt Co., *Jepson* 1946; Hupa Valley, *Davy* 5773; Happy Camp, Siskiyou Mts., *Morgan;* Medicine Lake mountains, e. Siskiyou Co., *M. S. Baker.*

Refs.—HYPOPITYS LANUGINOSA Nutt., Gen. 1:271 (1818); Jepson, Man. 738 (1925). *Monotropa lanuginosa* Michx., Fl. Bor. Am. 1:266 (1803), type from North Carolina. *Hypopitys fimbriata* Jepson, Man. 738 (1925), (? not H. fimbriata Howell). The bracts and sepals are sometimes irregularly or variably a little erose; but since this character has no constancy it seems to be, as to California plants, without significance in the differentiation of a second species in our area.

19. PTEROSPORA Nutt.

Reddish-brown saprophytic herb with a single tall stem arising from a thick ball of matted fibrous roots and ending above in a many-flowered raceme. Calyx deeply 5-parted, persistent. Corolla white, globular-urnshaped, with 5 short recurved lobes, withering-persistent. Stamens 10; anthers 2-awned on the back near the base, longitudinally dehiscent. Ovary 5-celled; stigma 5-lobed. Capsule depressed-globose, 5-lobed. Seeds innumerable, broadly winged from the apex.—Species 1. (Greek pteron, a wing, and spora, a seed.)

1. **P. andromedea** Nutt. PINE DROPS. (Fig. 314.) Stem stout, fleshy, 1 to 3 (or 4) feet high, glandular-pubescent throughout, bearing numerous lanceolate or linear scales; raceme virgate, dense at first; pedicels slender, spreading, soon recurved; calyx about ⅓ as long as the corolla; corolla white, 2½ to 3½ lines long.

Rich humus beneath pines, 4000 to 7500 feet, common: San Jacinto, San Bernardino and San Gabriel mountains; Sierra Nevada from Tulare Co. to Modoc Co.; North Coast Ranges from Lake Co. to Siskiyou Co. North to Alaska, east to Pennsylvania and Arizona, south to Mexico. June-July.

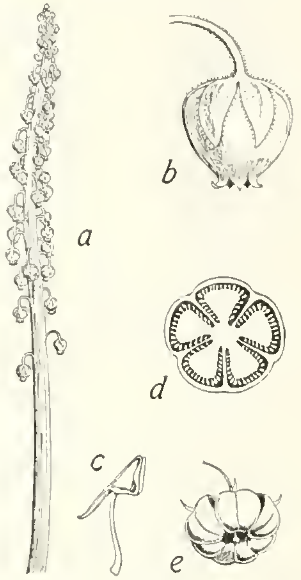

Fig. 314. PTEROSPORA ANDROMEDEA Nutt. *a*, fl. stem, × ⅓; *b*, fl., × 2; *c*, stamen, × 4½; *d*, cross sect. of ovary, × 5; *e*, capsule, × 1⅓.

Biol. note.—In such collections as have been made by us in the Sierra Nevada this species appears to be monocarpic, but it is evidently polycarpic in the Rocky Mts., where it was studied by D. T. MacDougal. He states that the short rootstock continues to send up flowering shoots "for two or possibly three seasons" (Ann. Bot. 13:31).

Locs.—S. Cal.: Onstatts Valley, San Jacinto Mts., *Hall;* Arrowhead Lake, San Bernardino Mts., *Braunton* 1060; San Antonio Cañon, San Gabriel Mts., *Peirson* 2272. Sierra Nevada: Giant Forest, *Newlon* 52; betw. Palisade Creek and Simpson Mdw., *E. Ferguson* 522; Huntington Lake, *A. L. Grant* 1144; Brightman Flat, Tuolumne Co., *A. L. Grant* 368; Dorrington, Calaveras Co., *Jepson* 10,170; Silver Lake, Amador Co., *E. Mulliken* 132; Truckee, Nevada Co., *K. J. Stirring;* Mineral, Tehama Co., *J. Grinnell;* Bear Valley mountains, ne. Shasta Co., *M. S. Baker;* North Fork Bidwell Creek, Warner Mts., *Jepson.* North Coast Ranges: Big Horse Mt., Lake Co., *Jepson* 14,668; Soldier Ridge, se. Trinity Co., *Jepson;* Horse Mt., Humboldt Co., *Tracy* 7673; Sisson, Siskiyou Co., *Jepson* 14,667; Humbug Mt., Siskiyou Co., *Butler* 1817.

Refs.—PTEROSPORA ANDROMEDEA Nutt., Gen. 1:269 (1818), type loc. Niagara Falls, Toronto, *Whitlow;* Lindl., Coll. Bot. t. 5 (1821); Jepson, Fl. W. Mid. Cal. ed. 2, 310 (1911), Man. 738, fig. 719 (1925).

20. **SARCODES** Torr.

Bright red or crimson saprophytic perennial herb with a single fleshy scaly stem arising from a thick ball of brittle roots and ending in a raceme of fleshy crimson flowers. Calyx of 5 distinct sepals, nearly equaling the corolla, glandular. Corolla red, campanulate, 5-lobed, glabrous. Stamens 10; anthers muticous but not awned, opening by terminal pores. Ovary low-conical, 5-celled, 10-lobed; style rather long; stigma capitate, somewhat 5-lobed. Capsule depressed, many-seeded, surrounded by the persistent calyx and corolla, the cells loculicidally dehiscent from top to bottom, the slit widest below and permitting the seed to fall out at the bottom.—Species 1. (Greek sarx, flesh, and oeides, resembling.)

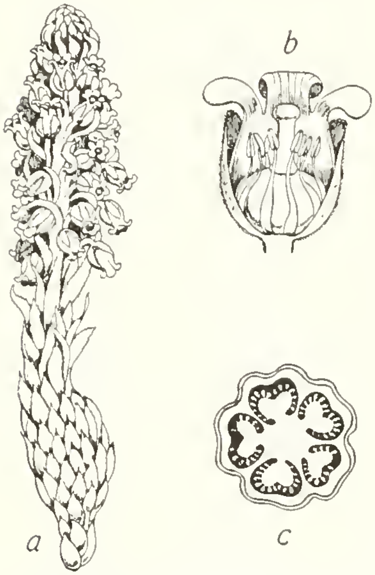

Fig. 315. Sarcodes sanguinea Torr. *a*, habit, × ¼; *b*, long. sect. of fl., × 1½; *c*, cross sect. of ovary, × 2.

Bibliog.—Austin, R. M., Sarcodes sanguinea (Bot. Gaz. 8:284–285,—1883). Oliver, F. W., On Sarcodes sanguinea (Ann. Bot. 4:303–326, pls. 17–21,—1890). Elwes, J. H., The Snow Plant of California (Madroño 1:131–132,—1923).

1. **S. sanguinea** Torr. Snow Plant. (Fig. 315.) Stems 6 to 15 inches high; scales ovate, the upper strap-shaped, all ciliate; sepals ciliate; corolla 6 to 9 lines long.

Pine woods, 4000 to 8000 feet, common: Siskiyou, Trinity and Humboldt Cos.; Sierra Nevada from eastern Siskiyou Co. to Tulare Co.; mountains of coastal Southern California. Lower California, western Nevada, and southern Oregon. June-July.

Ecol. note.—Under coniferous trees in rich deep humus is a favored habitat for Sarcodes sanguinea. The stems arise from a tuberous base to which is attached the large rather dense ball of coralline roots. This bulbous base sends up 1 to 3 or 4 flowering shoots or sometimes as many as 16. These shoots appear shortly after the snow melts from the slopes, probably never pushing up through the snow, although a late and light snow fall after they appear may give this impression. Sometimes the plants occur locally in great abundance. On the headwaters of the North Fork Tuolumne River, 45 stems were counted in a space four feet square (Frida Abernathy), and some 32 plants were found in a Tamrac Pine wood between Lily Creek and Gentry station near Yosemite in a space thirty feet square (Jepson Field Book, 41:16,—1924. ms.).

Locs.—North Coast Ranges: Cuddihy Valley (ridge above), w. Siskiyou Co., *Jepson* 2859; South Fork Mt., e. Humboldt Co., *Tracy* 8943; Lasseck Peak, Humboldt Co., *Goddard* 681. Sierra Nevada: Mt. Shasta (N. Am. Fauna 16:157); Morgan Sprs., Tehama Co., *Jepson;* Westwood, Lassen Co., comm. *Mary G. Clark;* Truckee, *Sonne;* Silver Lake, Amador Co., *E. Mulliken* 117; Gentry sta., Yosemite, *Jepson* 10,506a; Nellie Lake, Fresno Co., *A. L. Grant* 1077; Round Mdw., Giant Forest, *Jepson* 711. S. Cal.: Mt. Pinos, n. Ventura Co., *Epling & Dunn;* Icehouse Cañon, San Gabriel Mts., *Peirson* 460; Bear Valley, San Bernardino Mts., *Parish;* Mill Creek, San Bernardino Mts., *Jepson;* Saunders Mdw., San Jacinto Mts., *C. V. Meyer* 157; Santa Rosa Mts., *Jepson.*

Refs.—Sarcodes sanguinea Torr., Pl. Frem. 18, pl. 10 (1853), type loc. "Sacramento Valley, * * * probably on the Yuba River" (undoubtedly in the Sierra Nevada), *Fremont;* Jepson, Fl. W. Mid. Cal. 367 (1901), ed. 2, 310 (1911), Man. 739, fig. 720 (1925).

21. **NEWBERRYA** Torr.

Saprophytic herb. Stem white, scaly, short and often subterranean. Inflorescence flesh-pink, capitate, dense, composed of short 2 to 5-flowered cymose spikelets. Sepals bract-like, 2 in the lateral flowers, mostly 4 in the terminal ones, hairy within, less so externally. Corolla tubular-campanulate (or slightly urnshaped), very white-hairy within, slightly so or subglabrous outside, deeply 4-lobed in the lateral flowers, mostly 5 or 6-lobed on the terminal ones, withering-persistent. Stamens 6 to 12, mostly 8 or 10; filaments long-hairy at and above the middle; anther-cells 2, opening lengthwise. Ovary ovoid, 1-celled, hairy; placentae 4 to 10, sometimes with a placenta 2-lamellate; style short, long-hairy, the hairs appearing as a sort of collar beneath the yellow stigma; stigma strongly annular-umbilicate.—Species 1 or 2, Pacific North America. (Dr. J. S. Newberry, botanist of one of the Pacific Railroad surveys in 1855, and author of a memoir on the forest trees of northern California and Oregon.)

1. **N. congesta** Torr. (Fig. 316.) GNOME PLANT. Stem 1 to 4 inches high, very thick; corolla 4 to 7 lines long, the linear or oblanceolate sepals as long or longer; stigma conspicuous, forming a yellow eye to the flower.

Forest humus, 500 to 2500 feet: Redwood belt from Monterey Co. to Humboldt Co. Also in Nevada Co. North to Washington. June.

Flower note.—Segregation of this species into several is dependent upon structural features of the flower, which is, however, found to be more and more variable, as to its various parts, with each new gathering of this seldom-collected plant. The type of Hemitomes pumilum Greene agrees perfectly with the figures of Newberrya congesta (Hemitomes congestum Gray) in the Pacific Railroad Report (6^3:80, pl. 12), except in the cross section of the ovary. The ovary of Hemitomes pumilum shows 8 or 9 cord-like or roundish placentae, but towards the upper part of the ovary these placentae often become 2-lamellate. Since the structure of the placentae varies from top to bottom of the ovary-cell in our material, it is to be suspected that ample material of typical Newberrya congesta might show similar differences.

Locs.—Coast Ranges: Brookdale, Santa Cruz Mts., *Edwina Booth;* Big Basin, Santa Cruz Mts., *C. A. Reed;* Philo, Mendocino Co., *J. L. Collins;* ridge betw. Little River and Redwood Creek, Humboldt Co., *Tracy* 4740. Nevada Co.: Camptonville, *E. V. Schurr.*

Refs.—NEWBERRYA CONGESTA Torr., Ann. Lyc. Nat. Hist. N. Y. 8:55 (1867); Jepson, Man. 739 (1925). *Hemitomes congestum* Gray, Pac. R. Rep. 6^3:80 (1857), type loc. s. Ore., *Newberry. Newberrya spicata* Gray, Proc. Am. Acad. 15:44 (1879), type loc. North Fork Mad River, *Rattan. Hemitomes pumilum* Greene, Erythea 2:121 (1894), type loc. Mendocino coastal woods, *W. G. Wright* (typ. possideo). *Newberrya subterranea* Eastw., Proc. Cal. Acad. ser. 3, Bot. 1:80, pl. 7, fig. 4 (1897), type loc. Willow Creek cañon, south-central Santa Lucia Mts. in Monterey Co., *R. A. Plaskett.*

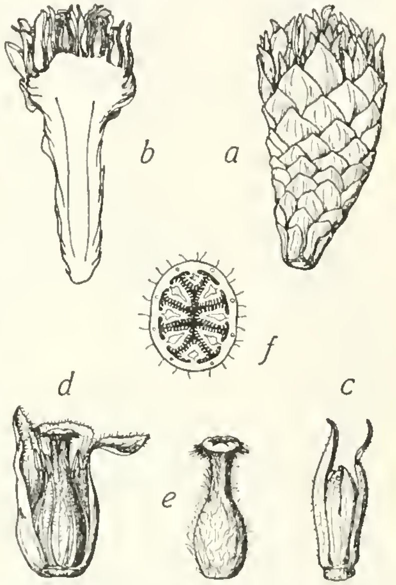

Fig. 316. NEWBERRYA CONGESTA Torr. *a*, habit, × ½; *b*, long. sect. through plant, × ½; *c*, fl. bud, × 1; *d*, long. sect. of fl., × 1½; *e*, pistil, × 2; *f*, cross sect. of ovary, × 5.

22. **PLEURICOSPORA** Gray

Whitish or light brown saprophytic herb with imbricated scales. Stems simple, arising in clusters from a thick ball of fibres and terminating in a dense spike. Flower parts all glabrous. Sepals 4 or 5 (or 6), distinct, scale-like, the margins remotely fimbriate. Petals 4 or 5 (or to 8), distinct. Stamens 8 or 10; filaments linear-filiform, glabrous. Ovary ovate, 1-celled, the 4 to 8 parietal placentae large, or 1 or 2 of them small. Style columnar; stigma umbilicate-capitate. Fruit a watery berry.—Species 1. (Greek pleuricos, at the side, and spora, seed, the placentae parietal.)

1. **P. fimbriolata** Gray. SIERRA-SAP. (Fig. 317.) Stems thick, fleshy, 2 to 8 inches high; corolla whitish, 5 to 8 lines long; sepals involute, the petals nearly

plane; stamens in 2 equal sets, the stamens of each set more approximate on one side than on the other; fruit whitish or at length blue-black.

Deep forest humus: Sierra Nevada, 4000 to 8300 feet, from Siskiyou Co. to Tulare Co.; Mendocino Co. to the Santa Cruz Mts., 1500 to 4000 feet. June-Aug.

Locs.—Sierra Nevada: Mt. Shasta (N. Am. Fauna 16: 157); Brush Creek, Butte Co., *Conger;* Truckee River, *Sonne;* Dorrington, Calaveras Co., *Jepson* 10,052; Cascade Creek, Middle Fork Stanislaus River, *Jepson* 6528; Strawberry, Tuolumne Co., *Jepson* 6496; Hazel Green, Mariposa Co., *Jepson* 14,607 (upper bracts with 2 ligulate lobes at base; lower flowers on pedicels ½ inch long, the upper sessile); Wawona, *Jepson* 4301 (stamens 8 in 2 sets, the sets more approximate on one side than the other); Huntington Lake, *A. L. Grant* 1143; McKinley Big Trees, Fresno Co., *A. L. Grant* 1204; Huckleberry Mdw., Giant Forest, *Newlon* 53. Coast Ranges: Signal Ridge near Yorkville, Mendocino Co., *W. W. Carruth;* Healdsburg (Zoe 4:154); Big Basin, Santa Cruz Mts., *C. A. Reed.*

Refs.—PLEURICOSPORA FIMBRIOLATA Gray, Proc. Am. Acad. 7:369 (1868), type loc. Mariposa Grove, *Bolander;* Jepson, Fl. W. Mid. Cal. 367 (1901), ed. 2, 310 (1911), Man. 740, fig. 721 (1925).

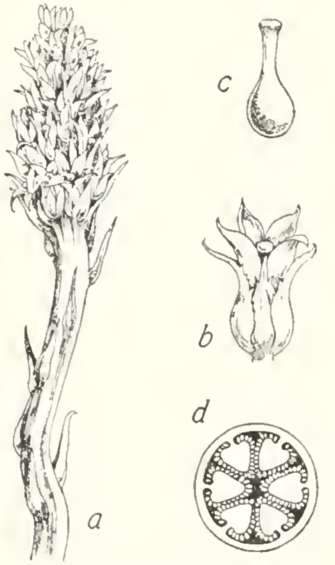

Fig. 317. PLEURICOSPORA FIMBRIOLATA Gray. *a*, fl. stem, × ½; *b*, fl., × 1; *c*, pistil, × 2; *d*, cross sect. of ovary, × 4.

23. PITYOPUS Small

Dull white saprophytic herb resembling Pleuricospora. Stems erect, simple, one or few from a small globular root-cluster and terminating in a sub-pyramidal raceme, the lowest pedicels ⅓ to 1½ inches long. Sepals 4 or 5, glabrous, sometimes indistinguishable from subtending calyx-bracts, these 2 to 4 or (apparently) suppressed. Corolla white; petals 4 or 5, distinct or nearly so, pubescent within, slightly exceeding the sepals, entire, more or less carinate toward the base and broadened just below the abruptly acute summit. Stamens 8 or 10; filaments pilose, densely so above, dilated below. Ovary globose, glabrous, 1-celled; placentae 6 to 10, large (almost filling cavity of ovary). Style equaling the ovary, hairy; stigma yellow, annular-umbilicate, a heavy collar of hairs beneath the annulus. Fruit unknown.—Species 1. (Greek pitus, pine, and pus, foot, from the habitat.)

1. **P. californica** Copel. f. Stems 2½ to 8 inches high; herbage glabrous; leaves scale-like, scattered, broadly ovate or deltoid-lanceolate, entire or erose, ⅓ to ¾ inch long; bracts resembling the stem leaves but smaller and lance-acute, those of lower pedicels linear-subulate, 2 to 3 lines long; sepals elliptic or narrowly oblong, acute, erosulate at summit; corolla white, 5 to 10 lines long; nectary disk-like, encircling base of ovary, bearing mamilliform teeth; anthers "red," globoid.

Deep forest shade, 1000 to 3000 feet, widely scattered and rare: Redwood belt from Marin Co. to Humboldt Co.; Fresno Co., Sierra Nevada. North to Oregon. June-July.

Tax. note.—In the excellent material collected by Virginia P. Fox on Bald Mt., Humboldt Co., in 1919, the petals, while markedly hairy within, are also hairy on the outside. They are 4 in number and united at the base in pairs, the pairs being anterior and posterior, and distinct laterally. The petals in the material examined by H. F. Copeland (cf. Madroño 3:155–156) are described as glabrous without.

Locs.—Little Carson Creek, Marin Co.; Bald Mt., Humboldt Co., *Virginia P. Fox;* Hupa, Humboldt Co., *Chandler;* Sequoia Lake, Fresno Co. (Madroño 3:155).

Refs.—PITYOPUS CALIFORNICA Copel. f., Madroño 3:155, pl. 5–8, fig. 1 (1935). *Monotropa californica* Eastw., Bull. Torr. Club 29:75 (1902), type loc. Little Carson Creek, Mt. Tamalpais, *Eastwood. M. hypopitys* var. *californica* Domin, Sitzber. boehm. Ges. Wiss. 2^1:24 (1915). *Pityopus oregona* Small, N. Am. Fl. 29:16 (1914), type loc. Mt. Hood, Ore., *T. Howell. Hypopitys californica* Hel., Muhl. 9:68 (1913).

PRIMULACEAE. Primrose Family

Herbs with simple undivided leaves. Flowers perfect, regular and symmetrical, 4 to 8-merous, commonly 5-merous, axillary and solitary, or in terminal racemes or umbels. Calyx toothed, lobed or parted. Corolla sympetalous, lobed or parted. Stamens opposite the lobes of the corolla and inserted on its tube at base. Ovary 1-celled, with a single style and stigma, superior, except in Samolus, where it is attached to the base of the calyx; ovules on a free central placenta. Fruit a capsule.—Glaux has no corolla, Samolus has 5 staminodia alternate with the stamens.—Genera 22, species about 500, all continents, but poorly represented in the tropics and in Australia.

Bibliog.—Gray, A., Essay towards a revision of Dodecatheon (Bot. Gaz. 11:231–234,—1886). Greene, E. L., Some species of Dodecatheon (Pitt. 1:209–214,—1888; Erythea 3:37–40,—1895). Brandegee, K., Dodecatheon meadia (Zoe 1:17–20,—1890); in this strange little paper all the species of the genus Dodecatheon are reduced to one. Pax, F., and Knuth, R., Primulaceae (Engler, Pflzr. 4^{237}:1–386, figs. 1–75, maps 1–2,—1905). Hall, H. M., Dodecatheon in the Sierra Nevada (Univ. Cal. Publ. Bot. 4:201–207,—1912). St. John, H., Revision of certain N. Am. species of Androsace (Victoria Memorial Mus. 126:45–55,—1922). Williams, L. O., Revision of the Western Primulas (Am. Midland Nat. 17:741–748, fig. 1,—1936). Eastwood, A., New species of Dodecatheon (Lflts. W. Bot. 2:36–38,—1937).

Ovary superior (wholly free); flowers not in racemes (except no. 5).
Stems scape-like, the leaves all basal; flowers in umbels.
Corolla-lobes reflexed; stamen-filaments monadelphous........1. Dodecatheon.
Corolla-lobes erect or spreading; stamen-filaments distinct (as in all the following).
Flowers large; corolla open at the throat, its lobes emarginate........2. Primula.
Flowers very small; corolla constricted at the throat, its lobes entire..3. Androsace.
Stems leafy.
Stems with the leaves in a single whorl at summit........4. Trientalis.
Stems leafy throughout.
Leaves opposite.
Flowers in dense oblong racemes; corolla pale yellow........5. Lysimachia.
Flowers axillary and solitary.
Corolla none........6. Glaux.
Corolla present, red........7. Anagallis.
Leaves alternate; corolla pinkish, minute........8. Centunculus.
Ovary adnate by its lower half to the calyx; flowers in racemes........9. Samolus.

1. **DODECATHEON** L. Shooting Star

Low perennial herbs with basal leaves and a naked scape bearing an umbel of few or many flowers. Corolla 5-parted, with very short tube and dilated thickened throat, the long and narrow divisions reflexed in flower (as also the calyx-lobes). Stamens on the throat of the corolla; filaments short and flat, monadelphous, but at length separable above. Style filiform, exserted. Fruit a capsule with columnar placenta, surrounded at base by the now erect calyx.—Species about 20, North America. (Greek dodeka, 12, and theos, god, the Primrose being under the care of the deities. Singular flowers similar to those of the cultivated Cyclamen.)

Filament-tube obsolete, or very short.
Capsule elliptic to broadly oblong, valvate from the very apex; leaves mostly acute or subacute; high montane or alpine species.
Herbage wholly glabrous; leaves 1 to 4 inches long; style not glandular......1. *D. alpinum.*
Stems and pedicels minutely glandular; leaves mostly 3 to 6 inches long; style usually glandular towards the base........2. *D. jeffreyi.*
Capsule narrow or cylindric, circumscissile near the apex; leaves mostly obtuse; Modoc Co........3. *D. conjugens.*
Filament-tube ⅕ to nearly as long as the anthers.
High montane; filament-tube very narrow, nearly as long as the anthers........4. *D. cusickii.*
Foothills and valleys, cismontane; filament-tube much shorter than the anthers, usually broader than long.
Root-crown without rice-grain bulblets; pedicels minutely glandular-hirsutulose, often obscurely or weakly so, the scapes glabrous or weakly or obscurely glandular-hirsutulose; leaves glabrous.

Plants mostly ¾ to 1½ feet high; umbels mostly 8 to 15-flowered; anthers 2 lines long, the connectives strongly rugose; mostly S. Cal. (cismontane).............5. *D. clevelandii.*
Plants mostly 3 to 5 inches high; umbels 2 to 7-flowered; anthers 1 line long, the connectives delicately rugulose; mostly Great Valley and bordering foothill ranges..........6. *D. patulum.*
Root-crown with rice-grain bulblets; herbage usually glabrous; Coast Range and Sierra Nevada foothills; San Bernardino Mts..........7. *D. hendersonii.*

1. **D. alpinum** Greene. ALPINE SHOOTING STAR. (Fig. 318.) Scapes slender, 3 to 13 inches high; leaves 1 to 4 (or 5) inches long, the blades narrowly spatulate or linear-oblanceolate, narrowed below to margined petioles; flowers mostly 4-merous; petals pink-crimson, the base whitish with a yellow zone edged beneath by a purple band; anthers 3 to 4 lines long; style exceeding the anthers ¼ to ¾ line; capsule exceeding the calyx, valvate from the very apex.

High montane meadows, 7000 to 10,900 feet: San Jacinto and San Bernardino mountains; northern Ventura Co.; Sierra Nevada from western Inyo Co. and Tulare Co. to Modoc Co.; high North Coast Ranges from northern Humboldt Co. to Siskiyou Co. North to Oregon. July.

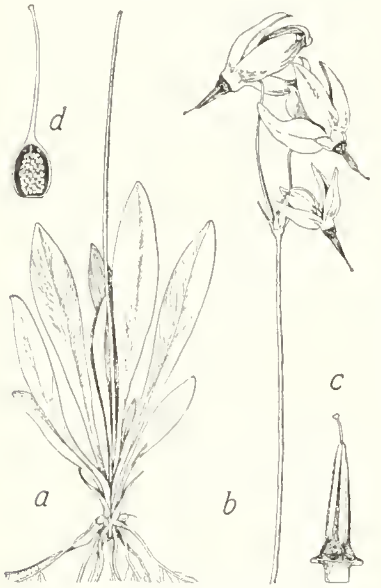

Fig. 318. DODECATHEON ALPINUM Greene. *a*, base of plant, × ½; *b*, fl. stem, × ½; *c*, stamen circle with exserted style, × 2; *d*, long. sect. of ovary, × 2.

Locs.—San Jacinto Mts.: Tahquitz Valley, *Condit;* Round Valley, *C. V. Meyer* 560. San Bernardino Mts.: Bluff Lake, *Parish* 3337; Bear Valley, *Parish* 3726; South Fork Mdws., Santa Ana Cañon. Ventura Co.: Sawmill Peak near Mt. Pinos, *Hall* 6520. Sierra Nevada: Cottonwood Lakes, w. Inyo Co., *W. P. Taylor;* East Fork Mdw., upper Kern Cañon, *Jepson* 5046; under West Vidette, Bubbs Creek, *Jepson* 821; Sonora Pass, *A. L. Grant* 165; Pacific Valley, Alpine Co., *Jepson* 10,163; Fallen Leaf Lake, Eldorado Co., *Ottley* 870; Squaw Peak, Placer Co., *C. J. Fox;* Brokeoff Mt. near Lassen Peak, *J. Grinnell;* High Grade, Warner Mts. (n. end), *L. S. Smith* 958. North Coast Ranges: South Fork Mtn., Humboldt Co., *Tracy* 8930; Trinity Summit, *Manning;* Marble Mt., *Chandler* 1572.

Refs.—DODECATHEON ALPINUM Greene, Erythea 3:39 (1895). *D. meadia* var. *alpinum* Gray, Bot. Cal. 1:467 (1876), type loc. high Sierra Nevada; Syn. Fl. 2:57 (1878). *D. jeffreyi* var. *alpinum* Gray, Bot. Gaz. 11:232 (1886). *D. alpinum* f. *nanum* Hall, Univ. Cal. Publ. Bot. 4:205 (1912), type loc. Mt. Dana, *Hall & Babcock* 3618 (typ. vidi), a dwarf alpine form, Mariposa Co. to Tulare Co. *D. tetrandrum* Suksd., Erythea 3:40 (1895), "throughout eastern Wash. and Ore.," *Suksdorf* et alii. *D. jeffreyi* var. *tetrandrum* Jepson, Man. 754 (1925). *D. subalpinum* Eastw., Lflts. W. Bot. 2:37 (1937), type loc. Silliman Crest, Tulare Co., *Derby* (typ. vidi).

2. **D. jeffreyi** Moore. SIERRA SHOOTING STAR. (Fig. 319.) Scapes 9 to 15 (or 19) inches high; herbage glabrous or microscopically glandular-hirsutulose; leaves 3 to 6 (or 11) inches long, the blades oblong-oblanceolate, gradually narrowed below to a winged petiole ⅙ to ¼ as long; peduncles, pedicels and calyx short-pubescent and somewhat viscid-glandular; flowers mostly 4-merous; corolla 8 to 12 lines long, the petals pink-crimson, a yellow zone at base edged below by a purple band; anthers 4 lines long; style equaling the anthers or exceeding them ½ line; capsule broadly oblong, shorter than, rarely exceeding the calyx, valvate-dehiscent from very apex, or from a circle just below the enlarged base of the style.

High montane, along streams and in moist meadows: Sierra Nevada, (4700 or) 7000 to 10,000 feet, from Tulare Co. to Tuolumne Co.; White Mts.; North Coast Ranges, 3500 to 7000 feet, from the Yollo Bolly Mts. to Siskiyou Co. North to Washington. June-Aug.

Locs.—Sierra Nevada: Hockett Mdws., Tulare Co., *Culbertson* 4380; Round Mdw., Giant Forest, *Jepson* 674; Huckleberry Mdws. near Grant Park, *Newlon* 208; Huntington Lake, Fresno Co., *A. L. Grant* 1022; Hog Ranch, near Hetch-Hetchy, *A. L. Grant* 973; Piute Mt., Tuolumne Co., *Jepson* 4578; Rancheria Mt., Tuolumne Co., *Jepson* 3405 (4, 5 and 6-merous flowers may be found on a single individual); White Wolf, Tioga Road, *H. M. Evans;* Herring Creek, Tuolumne Co., *A. L. Grant* 107. North Coast Ranges: South Yollo Bolly, *Jepson* 14,589; High Prairie, Bald Mt., Humboldt Co., *Tracy* 8340; Trinity Summit, *Jepson* 2105; Devils Cañon Mts., Trinity Co., *Tracy* 14,602; Marble Mt., w. Siskiyou Co., *Chandler* 1573; Summit Valley, Del Norte Co., *R. Van Deventer* 163.

Var. **redolens** Hall. MOUNTAINEERS SHOOTING STAR. Scapes 10 to 27 inches high; herbage odorous; leaves 6 to 19 inches long, often nearly equaling the scape, sometimes glandular, the blades oblong, acutish, gradually narrowed below to broad petioles about as long; flowers mostly 5-merous; corolla pink or purple with a yellow band below the white or whitish base, 7 to 13 lines long, not closely reflexed as in the species, but covering the base of the anthers; style exserted 1 to 2 lines.—Wet meadows, 7000 to 12,000 feet: San Jacinto Mts.; San Gabriel Mts.; Sierra Nevada from Tulare Co. to Mariposa Co.; White Mts. Western Nevada.

Locs.—S. Cal.: Deer Sprs., San Jacinto Mts., *C. V. Meyer* 544; Prairie Fork, San Gabriel River, *Peirson* 2516. Sierra Nevada: Mt. Whitney, *Jepson* 1068; upper Kern Cañon, *Jepson* 5045; Giant Forest, *K. Brandegee;* Kaiser Peak, *A. L. Grant* 1441; Eagle Peak Mdws., Yosemite, *Hall* 9203. White Mts.: Poison Creek, *Jepson* 7376. Nev.: Lee Cañon, Charleston Mts., *Heller* 11,027.

Refs.—DODECATHEON JEFFREYI Moore; Van Houtte, Fl. des Serres 16:99, t. 1662 (1867), based on a garden plant cultivated in Europe, the original collection by Jeffrey doubtless made in the Cascade Mts.; Jepson, Man. 753 (1925). *Meadia jeffreyi* Ktze., Rev. Gen. Pl. 2:398 (1891). *D. meadia* var. *lancifolium* Gray, Bot. Cal. 1:467 (1876). *D. jeffreyi* f. *pygmaeum* Hall, Univ. Cal. Publ. Bot. 4:203 (1912), type loc. Pyramid Peak, Lake Tahoe, *Hall & Chandler* 4739 (typ. vidi); plants about 3 to 6 inches high, the leaves (as compared with the typical form) correspondingly smaller; leaves (as well as the pedicels and calyces) more markedly glandular-hirsutulose than in the typical form; filament-tube short but evident. *D. glandulosum* Eastw., Lflts. W. Bot. 2:36 (1937), type loc. Desolation Valley, region of Lake Tahoe, *Eastwood* (typ. vidi), is the same as forma *pygmaeum* Hall. Var. REDOLENS Hall, Bot. Gaz. 31:392 (1901), type loc. Mt. Goddard, *Hall & Chandler* 132 (typ. vidi); Jepson, Man. 754 (1925). *D. jeffreyi* var. *odoratum* Eastw., Lflts. W. Bot. 2:36 (1937), type loc. Peregoy Mdw., Yosemite, *Enid Michael* (typ. vidi).

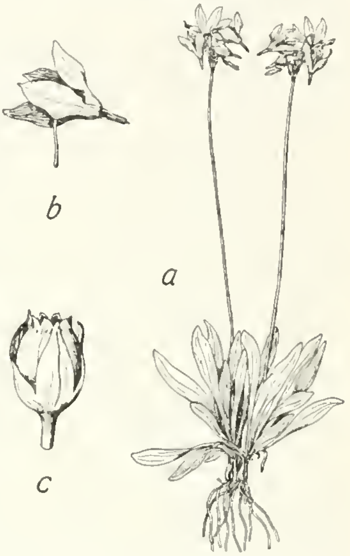

Fig. 319. DODECATHEON JEFFREYI Moore. *a*, habit, × ⅙; *b*, fl., × ½; *c*, capsule, × 1½.

3. **D. conjugens** Greene. MODOC SHOOTING STAR. Scapes 4 to 7 inches high; leaf-blades elliptic to oblong, 1 to 2¼ inches long, contracted to a mostly short petiole; flowers 5-merous; corolla purple, 7 to 9 lines long; filament-tube obsolete or nearly so; anthers distinct, 3 to 3½ lines long, the connective rugulose; capsule narrowly oblong or cylindric or tapering upwards, 4½ to 7 lines long, circumscissile just below the apex.

Damp places, 4000 to 5500 feet: Modoc Co. North to Washington, east to Idaho and Montana. Apr.-June.

Locs.—Goose Lake Valley, *R. M. Austin;* West Valley Camp, Warner Mts., *E. H. Steffen* 5; Lake City mountain, *Bruce* 2302.

Refs.—DODECATHEON CONJUGENS Greene, Erythea 3:40 (1895), type loc. Drew's Creek, se. Ore., *R. M. Austin;* Jepson, Man. 754 (1925). *D. glastifolium* Greene, Erythea 3:71 (1895), type loc. "lava beds of Modoc Co.," *R. M. Austin* 174; Jepson, Man. 754 (1925).

4. **D. cusickii** Greene. COLUMBIA SHOOTING STAR. Scapes slender, 2 to 6 inches high; leaf-blades oblong to obovate, ½ to 1⅛ inches long, attenuate below to a short or long petiole; corolla purplish, small (3½ to 4½ lines long); filament-column yellow or commonly yellow, very narrow, as long or nearly as long as the slender anthers; anther-connective purplish, smooth; style usually much exserted.

Montane slopes, 4000 to 6000 feet: Modoc Co. North to Washington and Idaho. May-July.

Locs.—Mt. Bidwell, *Manning*. Nev.: Paradise Valley, Humboldt Co., *Kennedy* 1046. Ore.: Steins Mts., *Cusick* 2007.

Var. **yosemitanum** (Mason) Jepson comb. n. Root-crown producing rice-grain bulblets; filament-column purple; otherwise similar to the species.—Wet meadows or flats, 8000 to 10,000 feet, Sierra Nevada: Kaiser Peak, Fresno Co., *A. L. Grant* 1011; head of Yosemite Creek.

Refs.—DODECATHEON CUSICKII Greene, Pitt. 2:73 (1890), type loc. "dry mountain ridges," e. Ore., *Cusick* 1527. *Meadia cusickii* Ktze., Rev. Gen. Pl. 2:398 (1891). Var. YOSEMITANUM Jepson. *D. hendersonii* var. *yosemitanum* Mason, Madroño 1:187 (1928), type loc. head of Yosemite Creek near Porcupine Flat, Mariposa Co., *Mason* 322.

5. **D. clevelandii** Greene. PADRES SHOOTING STAR. Scapes 1 to 1½ feet high; root-crown not producing rice-grain bulblets at flowering time; scapes, pedicels and calyces minutely glandular; leaves 1½ to 2¾ inches long, the blades obovate, irregularly and sometimes saliently erose-dentate or entire, shortly or long-petioled; flowers 5-merous; corolla bright purple to white, 6 to 11 lines long; connective of the anthers transversely much folded, usually yellow; capsule 4 to 5 lines long, twice as long as the calyx, dehiscent in a circle beneath the enlarged base of the style, then valvate-dehiscent below this; seeds reddish brown.

Dry hills and mesas, 20 to 2300 feet: cismontane Southern California. North to San Luis Obispo Co. Jan.-Apr.

Locs.—San Diego, *R. W. Sumner;* La Mesa, *Jepson* 6688; La Jolla, *Jepson* 11,864; Witch Creek, *R. D. Alderson;* Escondido, *C. V. Meyer* 24; San Bernardino, *Parish* 3632; Claremont, *Chandler;* Santa Monica Mts., *Barber;* Carrizo plain, se. San Luis Obispo Co., *Jepson* 12,005; Arroyo Grande, *Alice King;* San Luis Mt., *Summers.*

Refs.—DODECATHEON CLEVELANDII Greene, Pitt. 1:213 (1888), type loc. San Diego, *Cleveland;* Jepson, Man. 754 (1925). *Meadia clevelandii* Ktze., Rev. Gen. Pl. 2:398 (1891).

6. **D. patulum** Greene. LOWLAND SHOOTING STAR. Scapes only 3 to 5 (or 10) inches high; leaf-blades obovate, obtuse, ½ to 1¼ inches long, gradually narrowed to a broad petiole about ½ as long; corolla white, pale cream-color or rarely pinkish or purplish; anthers short and broad (1 line long), truncate or obscurely retuse at apex, the connectives wholly (or partially) yellow or white; filament-tube purple, always broader than long; capsule short-oblong or subglobose, circumscissile near the summit.

Slightly alkaline areas, 5 to 1500 feet: Sacramento and San Joaquin valleys and their bordering foothills; valleys of the South Coast Ranges and their bordering foothills, mostly toward the interior. Mar. Also called Prairie Pointers.

Locs.—Chico, *Purdy;* Oroville, *Heller* 11,178; College City, Colusa Co., *Alice King;* Sacramento, *M. S. Baker;* Mountain Pass, Tuolumne Co., *A. L. Grant* 620; Rocky Peak, Vacaville, *Jepson* 8217; Main Prairie, Solano Co., *Jepson* 14,590; Livermore, *Greene;* Fresno, *Maud Minthorn;* Delano (foothills e.), Kern Co., *Hoover* 743. As this species ranges southward it is difficult to distinguish from D. clevelandii, which species were, perhaps, better made a variety.

In the Santa Clara Valley, and on hills bordering it or near it, grows a form of D. patulum (var. BERNALIANUM Greene) which is somewhat taller (6 to 10 inches high) with the corolla usually purplish or rose-purple, but sometimes white.—Buriburi Ridge, San Mateo Co., *Jepson* 9556; Los Buellis Hills, *R. J. Smith;* Arroyo Mocho, Mt. Hamilton Range, *Jepson* 10,679; Gilroy; Pacheco Pass (e. base), *Hoover* 1664 (an intermediate to D. clevelandii).

Refs.—DODECATHEON PATULUM Greene, Pitt. 1:211 (1888), type loc. "low moist places along the lower Sacramento" River (the first cited station and the best representative of the prevailing form); Jepson, Fl. W. Mid. Cal. 377 (1901), ed. 2, 318 (1911), Man. 754 (1925). *D. meadia* var. *ellipticum* K. Brandegee, Zoe 1:20 (1890). *Meadia patula* Ktze., Rev. Gen. Pl. 2:398 (1891). Var. BERNALIANUM Greene, Erythea 3:72 (1895), type loc. Bernal Heights, San Francisco, *Greene;* Jepson, Fl. W. Mid. Cal. 377 (1901). *D. hendersonii* var. *bernalianum* Jepson, Man. 755 (1925). *D. laetiflorum* Greene, Pitt. 5:112 (1903), type loc. Gilroy, *C. F. Baker* 1945. *D. patulum* var. *laetiflorum* Jepson, Man. 755 (1925). *D. patulum* var. *gracile* Greene, Erythea 3:72 (1895), type loc. Loma Prieta, *Davy* (corolla white, the petals twisted); Jepson, Fl. W. Mid. Cal. 377 (1901).

DODECATHEON ELLIPTICUM Nutt.; Dur., Jour. Acad. Nat. Sci. Phila. ser. 2, 3:94 (1855), is as to the diagnosis a mixture of two or more species. Durand mentions first the plant of *Pratten* (Nevada City), next that of *Heermann* (Calaveras) and lastly that of *Nuttall* (plains of the Columbia River). Pratten's plant is not in the Herbarium of the Academy of Natural Sciences at Philadelphia. Nuttall's species, however, in the mind of Nuttall, rested on his own plant from the Columbia River, and though not mentioned first by Durand, should properly be taken as the type.

7. **D. hendersonii** Gray. California Mosquito Bills. Sailor Caps. Scapes red or reddish, 9 to 14 inches high, from a strong cluster of fleshy-fibrous roots; leaf-blades roundish-obovate to elliptic, the margin more or less crisped, 1 to 3 inches long, on petioles ½ to 2 times as long; umbels 3 to 13-flowered, the pedicels ½ to 3½ inches long; flowers 5 or sometimes 4-merous; calyx cleft into ovate-lanceolate lobes; corolla-lobes oblong, 6 to 7 lines long, ¾ to 1½ (or 2) lines wide, pink-crimson, with a transverse yellow zone at base, which is edged above by white and bounded below by a black-purple band; filament-tube black-purple, commonly broader than long, sometimes slightly longer than broad; anthers linear or clavate, 2 lines long; capsule oblong or short-cylindric, circumscissile well below the summit, then valvate.

Low slopes to high ridges in the foothills, 25 to 3000 feet: San Bernardino Mts; Coast Ranges from San Luis Obispo Co. to Siskiyou Co.; Sierra Nevada foothills from Tulare Co. to Shasta Co. North to Oregon. The most common species in California. It rarely occurs as high as 6700 feet. Feb.-Apr.

Biol. note.—The very short perennial root-crown in Dodecatheon hendersonii is somewhat corm-like. It bears a cluster of fleshy-fibrous roots as in our other species generally and also produces tuberous rootlets or elongated fleshy bulblets which are borne on the sides, often in great quantity. These bulblets are cast off in the autumn and in the next season each gives rise to a single leaf, forming distinct plants, which do not flower, however, until the second or third year. The bulblets are white and suggestive of the "rice-grain" bulblets of the Checker Lily (Fritillaria lanceolata). The corolla not infrequently varies to white.

Locs.—S. Cal.: Bear Valley, San Bernardino Mts. (Bull. S. Cal. Acad. 22:10). Coast Ranges: Pozo Range, se. San Luis Obispo Co., *Jepson* 11,989; Monterey, *N. K. Berg;* Los Gatos, *Heller;* Smith Creek, Mt. Hamilton, *Jepson* 4197; Mt. Diablo, *Jepson* 9848; Mill Valley, Marin Co., *Jepson* 14,584; Vaca Mts., *Jepson* 14,586; St. Helena, *Jepson* 14,587; Ukiah, *Purdy;* Hupa Mt., *Tracy* 8061; Cold Spr., 3 mi. sw. of Peanut, Trinity Co., *Jepson* 16,643; Quartz Valley, Siskiyou Co., *Butler* 1230. Sierra Nevada foothills: betw. Oak Flat and Badger, Tulare Co., *H. P. Kelley;* Columbia, Tuolumne Co., *A. L. Grant* 629; Jackson, *Hansen* 986; Pilot Hill, Eldorado Co., *Jepson* 18,590; Shasta Creek, Shasta Co., *Blankinship*.

Refs.—DODECATHEON HENDERSONII Gray, Bot. Gaz. 11:233 (1886), type loc. Tualatin plains, Ore., *Henderson*. *Meadia hendersonii* Ktze., Rev. Gen. Pl. 2:398 (1891). *D. meadia* var. *hendersonii* K. Brandegee, Zoe 1:20 (1890). *D. meadia* var. *brevifolium* Gray, Bot. Cal. 1:467 (1876), "warmer parts of the state." *D. cruciatum* Greene, Pitt. 1:213 (1888), type loc. San Francisco, *Greene;* (single individuals may bear both 4 and 5-merous flowers). *D. hendersonii* var. *cruciatum* Greene, Pitt. 2:75 (1890). *D. hendersonii* var. *hansenii* Greene, Erythea 3:71 (1895), type loc. Sierra foothills in Amador Co., *Hansen;* leaves entire, narrower than in the species; androecium shorter; anthers with spreading tips (ex char.). *D. sanctarum* Greene, Pitt. 5:113 (1903), type loc. s. Santa Lucia Mts., *R. A. Plaskett,* perhaps belongs here.

2. **PRIMULA** L.

Perennial herbs with basal leaves and scape-like stems bearing involucrate umbels. Calyx 5-toothed. Corolla salverform, its lobes obcordate or emarginate. Stamens 5, included, the filaments short. Capsule 5-valved at the top, many-seeded.—Species about 200, North America, Europe and Asia, and southern South America. (Latin primus, first, because of the early flowering.)

1. **P. suffrutescens** Gray. Sierra Primrose. (Fig. 320.) Scape 2 to 4 inches long, bearing an umbel of several flowers; leaves thickly crowded on creeping stems, ¾ to 1¼ inches long, the blades cuneate-spatulate, toothed at apex, narrowed below to broad petioles; corolla red, its tube surpassing the calyx, its limb ½ inch broad with spreading lobes.

Crevices of rocks and open slopes, alpine, 7000 to 13,500 feet: Sierra Nevada from Plumas Co. to Tulare Co.; Trinity Co. July.

Locs.—Mt. Pleasant, Plumas Co., acc. *P. G. Haddock;* Castle Peak, Nevada Co., *Sonne* 214; Clouds Rest, *Chesnut & Drew;* East Branch North Fork San Joaquin River, *Kennedy;* Minarets, Madera Co., *A. L. Grant* 1586; Kaiser Peak, *A. L. Grant* 1447; Bullfrog Lake, Bubbs Creek, *Jepson* 853; Alta Peak, *Hopping* 148; Kaweah Peak, *Jepson;* Mt. Whitney, *Jepson* 14,592. Trinity Co.: Devils Cañon Mts., *Tracy* 992.

Refs.—PRIMULA SUFFRUTESCENS Gray, Proc. Am. Acad. 7:37 (1868), based on spms. from the Sierra Nevada, *Lobb, Brewer* (Silver Mt.); Jepson, Fl. W. Mid. Cal. 377 (1901), ed. 2, 316 (1911), Man. 755 (1925).

3. ANDROSACE L.

Ours small annual herbs, with rosulate basal sessile leaves and few to several scapes bearing an involucrate umbel of small white or pink-tinted flowers. Calyx-lobes 5. Corolla somewhat salverform, its lobes 5 (or 4), its tube shorter than the calyx, its throat constricted; stamens short and inserted low down upon the tube. Style mostly short. Capsule subglobose, dehiscent by valves.—Species 84, North America, Asia and Europe. (Androsakes, Greek name of a now unknown seaplant.)

Bracts linear, acute; scapes many; pedicels ascending, shorter than the scapes; alpine............ ......
1. *A. septentrionalis.*
Bracts ovate-lanceolate, the tip attenuate-caudate; scapes few (commonly 1 to 4); pedicels stiffly ascending or divergent, often longer than the scapes; foothills and plains..............
2. *A. occidentalis.*

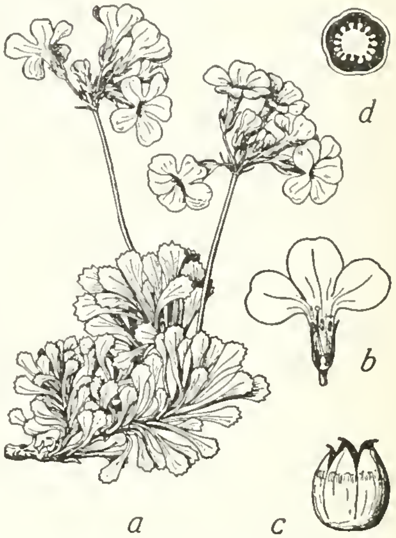

Fig. 320. PRIMULA SUFFRUTESCENS Gray. *a*, habit, × ½; *b*, long. sect. of fl., × ⅘; *c*, capsule, × 2; *d*, cross sect. of ovary, × 5.

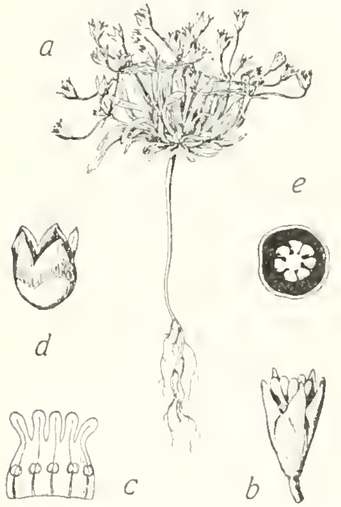

Fig. 321. ANDROSACE SEPTENTRIONALIS L. var. SUBUMBELLATA A. Nels. *a*, habit, × 1; *b*, fl., × 5; *c*, corolla spread open, × 5; *d*, capsule, × 5; *e*, cross sect. of ovary, × 10.

1. **A. septentrionalis** L. var. **subumbellata** A. Nels. (Fig. 321.) Plants very much condensed, ½ to 1 inch high, the scapes many from the dense tuft of basal leaves; leaf-blades linear, obtuse, sometimes remotely denticulate, 2 to 6 lines long; umbels 3 to 7-flowered, the pedicels 1 to 5 lines long, shorter than the scapes; corolla very slightly exceeding calyx-lobes.

Alpine, 11,400 to 12,700 feet: Mt. San Gorgonio; Mt. Whitney; Mt. Dana; White Mts. East to the Rocky Mts. The stations are few and scattered. July.

Locs.—Mt. San Gorgonio, *Hall* 7647; Twin Lakes, Mt. Whitney, *Peirson* 856; Mt. Dana, *Jepson* 3306; McAfee Mdws., White Mts., *Jepson* 7399.

Refs.—ANDROSACE SEPTENTRIONALIS L., Sp. Pl. 142 (1753), Lapland and Russia. Var. SUBUMBELLATA A. Nels., Bull. Wyom. Exp. Sta. 28:149 (1896), type loc. Union Peak, Wyo., *Nelson* 998; Jepson, Man. 755 (1925).

2. **A. occidentalis** Pursh var. **acuta** Jepson. Plants ¾ to 2 inches high; leaf-blades linear-lanceolate, 3 to 5 lines long; scapes spreading, ½ to 1¼ inches long; umbels 3 to 7-flowered, the pedicels very unequal, some often longer than the scape, ½ to 1⅜ inches long; calyx-lobes mostly shorter than the tube; corolla white, 1 line long, scarcely exserted from calyx-tube.

Hilltops and plains, 1500 to 2200 feet: Coast Ranges from Tehama Co. to San Luis Obispo Co.; south to San Diego Co.; the stations widely scattered and mostly back of the coast. Feb.-Apr.

Locs.—Paskenta, Tehama Co., *Jepson* 16,323; San Pablo Ridge, Contra Costa Co., *Tracy* 1314; Berkeley Hills, *Tracy* 1344; Corral Hollow, e. Alameda Co., *Hoover* 1748; Carrizo Plain, San Luis Obispo Co., *Jepson* 12,016; Tehachapi Pass, *Peirson* 5483; Warners Hot Sprs., acc. *P. A. Munz.*

Refs.—ANDROSACE OCCIDENTALIS Pursh, Fl. 1:137 (1814), type loc. "banks of the Missouri" River, *Nuttall.* Var. ACUTA Jepson, Man. 755 (1925). *A. acuta* Greene, Man. Reg. S. F. Bay 238 (1894), type loc. Contra Costa Co. *A. septentrionalis* Jepson, Fl. W. Mid. Cal. 376 (1901), ed. 2, 316 (1911).

4. TRIENTALIS L.

Low and glabrous perennials. Root-stocks tuberous, sometimes stoloniferous. Stem simple, bearing scales or small leaves below and a single whorl of large leaves above, from the center of which the filiform pedicels arise. Flowers commonly 6 (5 or 7)-merous. Corolla rotate, deeply parted. Filaments long and filiform, united at base into a very short ring. Style filiform. Capsule valves 5, revolute.—Species 3, North America, Europe, Asia. (Latin trientalis, containing one-third of a foot, in allusion to the height of the plants.)

1. **T. europaea** L. var. **latifolia** Torr. STARFLOWER. (Fig. 322.) Stems 4 to 6 inches high, from tubers 1/3 to nearly 1 inch long; leaves of the terminal whorl commonly 4 or 5 (rarely 3, 6 or 7), the blades broadly obovate, abruptly acute, 1 to 2½ (or 3½) inches long, drawn down to a very short petiole; pedicels ¾ to 2 inches long; corolla white or rose-red, 4 to 8 lines broad, its divisions abruptly acuminate and prolonged into a slender point; calyx-lobes narrowly linear-lanceolate, mucronate, exceeding the capsule.

Shade of woods, 100 to 4000 feet: Coast Ranges, mostly in the seaward and middle ranges from San Luis Obispo Co. to Siskiyou Co.; Sierra Nevada from Mariposa Co. to Shasta Co. North to British Columbia. May-June.

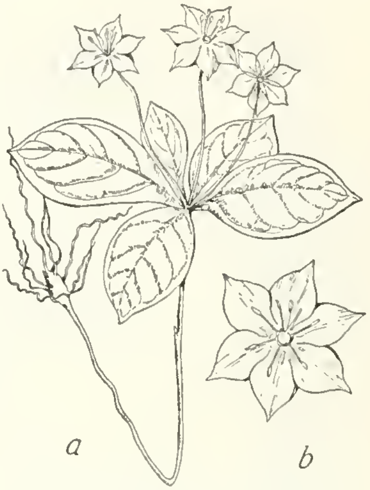

Fig. 322. TRIENTALIS EUROPAEA var. LATIFOLIA Torr. *a*, habit, × ½; *b*, fl., × 1.

Locs.—Coast Ranges: San Luis Obispo, *Unangst;* Santa Lucia Mts., *J. H. Barber;* Santa Cruz, *F. P. McLean;* Berkeley, *Jepson* 14,583; Mill Valley, *Tidestrom;* Howell Mt., *Jepson;* South Mill Creek, Ukiah, *Jepson* 9264; Ft. Bragg, *W. C. Mathews;* Bull Creek, near Dyerville, *Jepson;* Eureka, *Tracy* 798; Forest Glen, South Fork Trinity River, Trinity Co., *Jepson;* Shasta Sprs., *Geo. B. Grant* 5245; Humbug, Siskiyou Co., *Butler* 765. Sierra Nevada: Crockers sta., Mariposa Co.; Yankee Hill, Columbia, *A. L. Grant* 674; Calaveras Big Trees, *A. L. Grant;* Rich Pt., Plumas Co., *Jepson;* near Viola, Tehama Co., *J. Grinnell;* Hatchet Creek, Shasta Co., *M. S. Baker;* McCloud River near Bartles, *M. S. Baker.*

Refs.—TRIENTALIS EUROPAEA L., Sp. Pl. 344 (1753), type European. Var. LATIFOLIA Torr., Pac. R. Rep. 4:118 (1860); Jepson, Fl. W. Mid. Cal. 375 (1901), ed. 2, 316 (1911), Man. 756 (1925). *T. latifolia* Hook., Fl. Bor. Am. 2:121 (1838), type loc. "about Fort Vancouver. Wallawallah River," *Tolmie. Alsinanthemum europaeum* Greene var. *latifolium* Greene, Man. Reg. S. F. Bay 238 (1894).

5. LYSIMACHIA L.

Perennial herbs, the herbage glabrous (in ours), the stems arising terminally from rootstocks, leafy throughout. Leaves opposite, glandular-dotted. Corolla yellow (in ours), rotate, very deeply parted (with hardly any tube), its lobes convolute in the bud. Capsule few to several-seeded.—Species 110, all continents but mostly northern hemisphere. (Greek lusis, loose, and mache, strife.)

Flowers solitary in the axils; corolla without teeth between the lobes; filaments slightly monadelphous at base........1. *L. nummularia.*
Flowers in axillary racemes; corolla with a small tooth in each sinus; filaments distinct........2. *L. thyrsiflora.*

1. **L. nummularia** L. Moneywort. Stems creeping, 4 to 12 inches long; leaf-blades orbicular to broadly ovate, 6 to 9 lines long, on petioles 1 to 2 lines long; calyx-lobes cordate-ovate; corolla 6 to 7 lines broad.

Moist meadows, 3400 to 3600 feet, naturalized from Europe: Quincy. June-July.

Refs.—Lysimachia nummularia L., Sp. Pl. 148 (1753), type from Europe; Syme, Engl. Bot. 7:t. 1144 (1867).

2. **L. thyrsiflora** L. Tufted Loosestrife. Stems erect, simple, ¾ to 2 feet high; herbage glabrous; leaf-blades sessile, linear- to broadly lanceolate, 1¼ to 4¾ inches long, those on the lower part of the stem reduced to short broad scales; racemes ½ to 1 inch long, dense, usually 1 or 2 pairs in the lower leaf-axils, borne on peduncles ¾ to 2 inches long; corolla 1½ to 2 lines long, the style much exserted.

Wet bogs and in shallow water of lakes, 3000 to 4400 feet: Plumas Co. to Shasta Co. North to Oregon and Alaska, east to Pennsylvania. Europe, Asia. May-June.

Locs.—Big Mdws., Plumas Co., *R. M. Austin;* Goose Valley, Shasta Co., *Baker & Nutting.*

Refs.—Lysimachia thyrsiflora L., Sp. Pl. 147 (1753), type European. *Naumburgia thyrsiflora* Reichb., Fl. Germ. Excurs. 410 (1832).

6. GLAUX L.

Somewhat succulent perennial with opposite leaves, distinguished from all other genera of the family by the absence of a corolla. Calyx purplish or white, campanulate, 5-lobed, assuming the appearance of a corolla, the stamens alternating with its lobes. Capsule 5-valved at apex. Seeds few, immersed in the tissue of the placenta.—Species 1. (Greek glaukos, sea-green.)

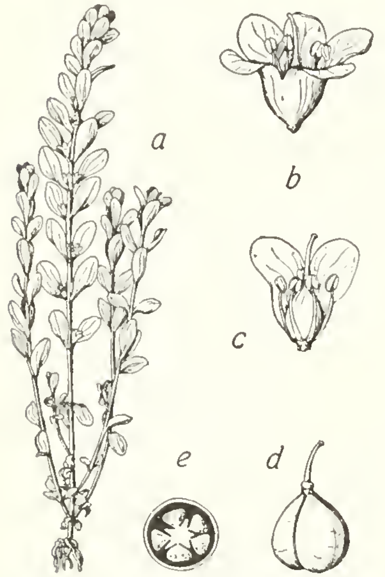

Fig. 323. Glaux maritima L. *a,* habit, × ½; *b,* fl., × 3; *c,* long. sect. of fl., × 3; *d,* capsule with persistent style, × 4; *e,* cross sect. of ovary, × 5.

1. **G. maritima** L. Sea Milkwort. (Fig. 323.) Stems 8 to 14 inches high, erect or ascending, simple or eventually branching, arising from slender running rootstocks; leaf-blades oblong, 4 to 9 lines long; flowers 2 lines long, solitary in the axils, almost sessile; calyx-segments elliptic; capsule globose, a little over 1 line long.

Marshy shores of bays and sea coasts, 5 to 25 feet, or on saline flats in the interior, 2500 to 4500 feet: San Luis Obispo Co. north to Humboldt Bay. North to Alaska, east through the Great Basin and far east to New Jersey and Newfoundland. Europe, Asia. May-June.

Locs.—Pismo, San Luis Obispo Co., *Condit;* Martinez, *Davy* 6665; Suisun, *C. F. Baker* 3244; Petaluma, *Davy* 4060; Pt. Reyes, *Davy* 6735; Hookton, Humboldt Bay, *Tracy* 3698.

Refs.—Glaux maritima L., Sp. Pl. 207 (1753), type European; Jepson, Fl. W. Mid. Cal. 375 (1901), ed. 2, 316 (1911), Man. 756 (1925). *G. acutifolia* Hel., Muhl. 2:109 (1906), type loc. Gazelle, Shasta Co., *Heller* 8073; leaves mainly linear, acute; calyx divided almost to the base; anthers oblong-elliptical (ex char.).

7. **ANAGALLIS** L. PIMPERNEL

Low annuals with opposite or sometimes ternate entire leaves. Flowers axillary, on slender pedicels. Calyx deeply 5-cleft into narrow segments. Corolla rotate, deeply 5-parted, the rounded lobes convolute in the bud. Stamens 5; filaments hirsute or pubescent. Capsule circumscissile.—Species about 24, all continents. (Greek, meaning delightful.)

1. **A. arvensis** L. POOR MAN'S WEATHER-GLASS. Stems ½ to 2 feet long, procumbent or ascending; leaf-blades ovate or deltoid-ovate, acute, sessile, 4 to 6 (or 10) lines long, shorter than the pedicels; flowers opening only under a clear sky; sepals lanceolate, acuminate, scarious-margined toward the base, nearly distinct; corolla vermilion, 4 to 5 lines broad, the petals lightly joined at base, minutely glandular-ciliate at apex; capsules on recurved pedicels; seeds ½ line long, triangular, the surface pitted.

Naturalized Old World weed, in open ground, 5 to 2000 feet: mostly near the coast. Mar.-Apr.

Locs.—Coastal: Crescent City, *Howell;* Eureka, *Tracy* in 1906; Dyerville, South Fork Eel River, *Constance* 703; Pt. Reyes, *Davy* in 1900; Berkeley, *Jepson* in 1891; Oakland, *Brewer* in 1864; San Francisco, *Jepson* 10,594; Carmel River, near Carmel, *Jepson* in 1896; Santa Barbara, *Brewer* in 1861; Lukens Peak, San Gabriel Mts., *Peirson* 331; Claremont, *Chandler* in 1897; Riverside, *Jepson* in 1901; Escondido, San Diego Co., *C. V. Meyer* 268; La Jolla, *Jepson* 11,872. Interior: San Andreas, *Jepson* in 1923; Barnafee Flat, Tulare Co., *W. Fry* 127.

Var. **coerulea** Ledeb. Corolla blue.—Bear River Ridge, Humboldt Co., *Tracy* 9936; Mt. Diablo, *Jepson* 9865 in 1923; Altadena, acc. *Peirson;* Fallbrook, in 1884 (acc. Parish, Bull. S. Cal. Acad. 19^4:23); Escondido, *C. V. Meyer* 271 in 1927.

Refs.—ANAGALLIS ARVENSIS L., Sp. Pl. 148 (1753), type European; Jepson, Fl. W. Mid. Cal. 375 (1901), ed. 2, 317 (1911), Man. 756 (1925). Var. COERULEA Ledeb., Fl. Rossica 3:30 (1847). *A. coerulea* Schreb., Spicilegium Fl. Lipsicae 5 (1771).

8. **CENTUNCULUS** L.

Very small annuals with alternate entire leaves and minute solitary flowers in their axils. Calyx 4 (or 5)-parted, the narrow lobes linear-lanceolate, acuminate. Corolla 4 (or 5)-cleft, the tube subglobular and lobes acute. Stamens 4 or 5, inserted on the throat of the corolla. Capsule globose, circumscissile. Seeds many.—Species 1. (Meaning of name obscure.)

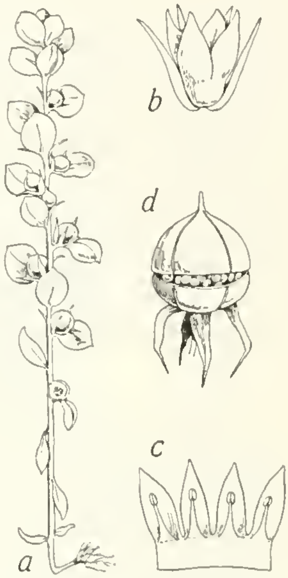

Fig. 324. CENTUNCULUS MINIMUS L. *a,* habit, × 1; *b,* fl., × 8; *c,* corolla spread open, × 8; *d,* dehiscing capsule, × 5.

1. **C. minimus** L. CHAFFWEED. (Fig. 324.) Slender, glabrous, 1 to 5 inches high; leaf-blades obovate, sessile or short-petioled, 1 to 2 (or 3) lines long; flowers sessile or very nearly so, shorter than the leaves, mostly 4-merous; filaments much dilated at base.

Moist ground or beds of former winter pools, 10 to 1400 feet: mostly near the coast from San Diego Co. to Humboldt Co.; Merced Co. to Calaveras Co. North to British Columbia, east to Illinois and Florida. South America, Europe. May.

Locs.—Coastal: La Jolla, San Diego Co., *Jepson* 11,850; Ramona, *K. Brandegee;* Red Hill, Upland, *Munz* 5556; Berkeley Hills, *Tracy* 2072; Suisun, *Greene;* Fort Seward, Humboldt Co., *Tracy* 13,384; Eureka, *Tracy* 1943. Sierra Nevada foothills from Merced Co. to Calaveras Co.: Le Grand, *Hoover* 1085; Burson, *Jepson* 9927.

Refs.—CENTUNCULUS MINIMUS L., Sp. Pl. 116 (1753), type European; Jepson, Fl. W. Mid. Cal. ed. 2, 317 (1911), Man. 757 (1925).

9. **SAMOLUS** L. BROOKWEED

Glabrous perennial herbs with alternate leaves. Flowers small, white, 5-merous, in terminal racemes. Calyx adherent to the base of the ovary, campanulate. Corolla nearly campanulate. Stamens 5, borne on the tube of the corolla, their filaments short; a second series of stamens represented by 5 sterile filaments or staminodia inserted in the sinuses of the corolla and alternating with the anther-bearing stamens. Capsule opening at the apex by 5 valves.—Species 10, all continents. (Celtic name.)

1. **S. floribundus** H. B. K. WATER PIMPERNEL. Stem commonly solitary, erect, simple or branching above into 2 or 3 racemes, or paniculate, 6 to 15 inches high; basal leaves rosette-like, their blades round-obovate to oblong-spatulate, obtuse or almost truncate, narrowed toward the base into a broad short petiole, 1 to 2½ inches long; cauline leaves similar, the uppermost varying to elliptic, ½ to 1 inch long; pedicels slender, bractless, but bearing minute bractlets at their middle; flowers ¾ to 1½ lines long; calyx-teeth short, broadly triangular; corolla very small, white, its lobes almost distinct.

Brooks and marshes, 5 to 4000 feet: Solano and Contra Costa Cos.; cismontane Southern California. North and South America. July-Sept.

Locs.—Suisun Marshes, *Davy* 4113; Antioch, *K. Brandegee;* Santa Cruz Isl., *Greene;* Topanga Cañon, Santa Monica Mts., *Barber;* San Bernardino Mts., *Geo. Robertson* (Arrowhead Sprs.), *R. J. Smith* (Morton Creek); San Bernardino, *Parish;* Riverside, *Jepson* 14,581; Santa Ana Cañon, Orange Co., *J. T. Howell* 2775; Bolsas Creek, Orange Co., *Booth* 1284; Ramona, *K. Brandegee.*

Refs.—SAMOLUS FLORIBUNDUS H. B. K., Nov. Gen. 2:224 (1817), type loc. Callao, Peru; Jepson, Fl. W. Mid. Cal. ed. 2, 316 (1911), Man. 757 (1925). *S. valerandi* var. *americanus* Gray, Man. ed. 2, 274 (1856); Jepson, Fl. W. Mid. Cal. 374 (1901).

PLUMBAGINACEAE. THRIFT FAMILY

Maritime perennial herbs with hard or coriaceous scapes and basal leaves. Flowers regular, perfect, 5-merous throughout. Calyx tubular or funnelform, plaited. Petals with long claws barely united into a ring at base. Stamens opposite the petals, adnate to the base of the claw. Ovary superior, 5-angled at summit, containing a single ovule which hangs from an elongated funiculus arising from the base of the cell. Styles 5. Fruit a utricle or achene, borne in the base of the persistent calyx. Seed with endosperm; embryo straight.—Genera 10, species about 325, all continents.

Bibliog.—Gray, A., Plumbaginaceae in Syn. Fl. 2:53–55 (1878). Blake, S. F., Limonium in N. Am. & Mex. (Rhod. 18:53–66, pls. 118–119,—1916); Statice in N. Am. (Rhod. 19:1–9,—1917); N. Am. species of Limonium (Rhod. 25:55–60,—1923).

Leaves narrowly linear; inflorescence head-like.................1. STATICE.
Leaves broad; inflorescence paniculate.................2. LIMONIUM.

1. **STATICE** L. THRIFT

Scape naked, terminating in a globose head of flowers. Leaves narrowly linear, sedge-like, in a close tuft. Heads composed of numerous crowded clusters, each cluster subtended by a scarious bract, the outer bracts forming an involucre, the two outermost united and forming a reversed sheath to the summit of the scape. Flowers pediceled or subsessile, subtended by bractlets. Calyx scarious, funnelform. Styles filiform, united at the very base.—Species about 35, all continents except Australia. (Greek, statike, astringent.)

1. **S. arctica** Blake var. **californica** Blake. CALIFORNIA SEA-PINK. (Fig. 325.) Scapes few or solitary, 7 to 20 inches high; leaves involute-channeled, ⅓ to 1 line wide, bluntish at tip, (1½ or) 4 to 8 inches long; flowers dull pink or flesh-color; calyx-tube 5-ribbed, the ribs hairy.

Sea-beaches, sea-bluffs or sandy fields along the ocean, 1 to 100 feet: Monterey Co. to Humboldt Co. Apr.-June.

Locs.—Carmel, *Newlon* 139; Pescadero, *A. L. Grant* 940; San Francisco, *Davy* 821; Pt. Reyes, *Jepson* 1188; Salmon Creek, Sonoma Co., *Jepson* 15,944; Pudding Creek, Ft. Bragg, *Jepson* 17,731; Humboldt Bay, *Chandler* 1153.

Refs.—STATICE ARCTICA Blake, Rhod. 19:8 (1917). *Armeria vulgaris* Willd. f. *arctica* Cham., Linnaea 6:566 (1831), type loc. Unalaska, Aleutian Isls., *Chamisso*. *Armeria arctica* Wallr., Beitr. 2:193 (1844). Var. CALIFORNICA Blake, Rhod. 19:9 (1917); Jepson, Man. 758 (1925). *Armeria andiana* Poepp. var. *californica* Boiss.; DC., Prod. 12:682 (1848), type from Cal., *Coulter*. *A. vulgaris* Jepson, Fl. W. Mid. Cal. 378 (1901), ed. 2, 318 (1911), and other Cal. authors.

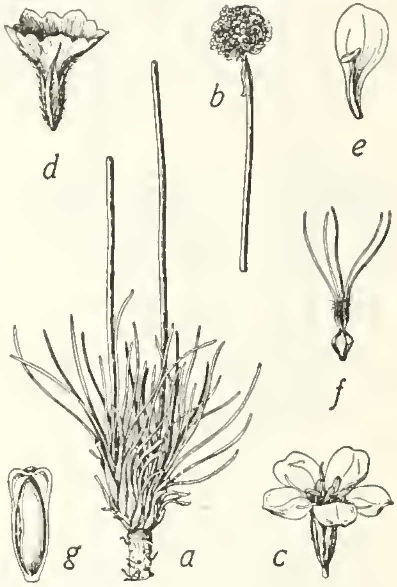

Fig. 325. STATICE ARCTICA Blake var. CALIFORNICA Blake. *a*, base of plant, × ⅓; *b*, infl., × ⅓; *c*, fl., × 2; *d*, calyx, × 2½; *e*, petal and stamen, × 3; *f*, pistil, × 4; *g*, long. sect. of ovary, × 5.

2. **LIMONIUM** Hill. MARSH ROSEMARY

Leaves broad, fleshy, in a basal tuft. Flowers secund, in short spikes or clusters terminating the many branchlets of a branching scape. Calyx vase-shaped. Styles wholly distinct.—Species about 120, sea-beaches, all continents. (Greek name of the wild beet.)

1. **L. commune** S. F. Gray var. **californicum** Greene. WESTERN MARSH ROSEMARY. Scapes ⅔ to 1½ (or 2) feet high, loosely paniculate, the root ½ to 1 inch thick, reddish, woody; leaves 4 to 9 inches long, the blades obovate- to oblong-spatulate, obtuse or sometimes retuse, tapering below into a rather long petiole; flowers violet-purple; calyx hairy on the angles below; petals oblong, 2 to 2½ lines long.

Salt marshes and sea-beaches along the coast and its bays, 1 to 50 feet: San Diego Co. to Humboldt Co. July-Dec.

Locs.—San Diego (Rhod. 25:59); Newport Bay, Orange Co., *Booth* 1229; Wilmington, *Parish* 959; Pt. Mugu, Ventura Co., *J. T. Howell* 3131; Palo Alto, *C. F. Baker* 1516; West Berkeley, *Jepson* 14,593; Manzanita sta., Marin Co., *Jepson* 10,656; Benicia, *Jepson* 14,594; Samoa, *Tracy* 1254.

Var. **mexicanum** (Blake) Jepson comb. n. Calyx glabrous.—San Diego Bay. South to Lower California. This form matches the species in all details of habit, leaves, inflorescence, flowers and fruit, save only that the calyx-ribs are not hairy. Since it is said by Blake to occur in the San Francisco Bay region, it would in such case lose geographic significance and much of its slight claim to even varietal rank.

Refs.—LIMONIUM COMMUNE S. F. Gray, Nat. Arr. British Pls. 2:296 (1821), type loc. seashores of Britain. Var. CALIFORNICUM Greene, Man. Reg. S. F. Bay 235 (1894); Jepson, Man. 758 (1925). *Statice californica* Boiss.; DC., Prod. 12:643 (1848), based on spms. from San Francisco (*Barclay*) and Santa Clara (*Sinclair*). *S. limonium* var. *californicum* Gray, Bot. Cal. 1:466 (1876); Jepson, Fl. W. Mid. Cal. 378 (1901), ed. 2, 318 (1911). *L. californicum* Hel., Cat. N. Am. Pl. ed. 1, 6 (1898). Var. MEXICANUM Jepson. *L. mexicanum* Blake, Rhod. 18:59 (1916), type loc. San Diego, *Palmer* 216.

LIMONIUM SINUATUM Mill., Gard. Dict. ed. 8, n. 6 (1768). *Statice sinuata* L., Sp. Pl. 276 (1753), "Sicilia, Palestina, Africa." Scapes 1 to 2 feet high, corymbosely-paniculate, the internodes of the scapes and inflorescence broadly or narrowly winged, the wings produced upward at the nodes into 3 (or 2) linear-lanceolate appendages ¾ to 1½ inches long; leaves pinnatifid; calyx blue; corolla yellowish-white.—Garden plant from the Mediterranean region, occasionally escaped, 5 to 100 feet: San Diego coast (Del Mar, *F. M. Reed*; Imperial Beach, *Peirson* 3397).

STYRACACEAE. STORAX FAMILY

Shrubs or trees with alternate simple leaves. Flowers regular and perfect, the calyx in ours slightly adherent to the base of the ovary; petals 4 to 10, united or connivent at base into a short tube; stamens about twice the number of petals. Ovary 2 to 5-celled; style 1.—Genera 7, species 117, all continents.

Bibliog.—Lindley, J., Styracaceae in Introduction to the Natural System of Botany, 179–180 (1830). Perkins, J., Styracaceae (Engler, Pflzr. 4^{241}:1–111, figs. 1–18,—1907).

1. **STYRAX** L. Storax

Corolla white, seated in a campanulate calyx whose truncate border is denticulate, irregularly toothed or split down one side. Stamens 10 to 18, their filaments united for nearly their whole length into a tube, the lower portion of which is adherent to the base of the corolla. Ovary 1-celled through imperfect partitions but 3-celled at base. Style slender. Fruit globose, 1-celled, commonly splitting into 3 valves, with a single large nut-like or bony seed.—Species 60, North and South America, Europe, Asia. (Ancient Greek name, used by Theophrastus, for the species which produces storax.)

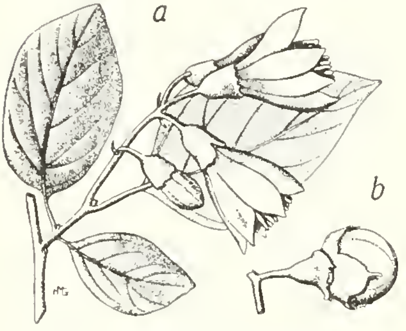

Fig. 326. Styrax officinalis L. *a*, fl. branchlet, × 1; *b*, fr., × ¾.

1. **S. officinalis** L. Snow-drop Bush. (Fig. 326.) Deciduous shrub 5 to 10 feet high; leaf-blades orbicular to ovate (or somewhat rhomboidal), entire, minutely stellate or rusty-pubescent beneath, or in age glabrate, 1 to 2½ inches long, on tomentose petioles 2 to 4 lines long; flowers a little resembling orange blossoms, 2 or 3 (to 5) in a terminal corymbose raceme, the cluster borne on a very short peduncle; pedicels somewhat clavate; calyx border with 5 to 7 short teeth; petals 5 to 10, oblong or somewhat narrowed towards the base, 6 to 7 lines long; stamen-tube pubescent with short soft hairs within; seeds 6 lines in diameter.

Cañons, frequently on south slopes, often on shale, 400 to 3000 feet: inner North Coast Range from Lake Co. to western Shasta Co.; Sierra Nevada foothills from eastern Shasta Co. to Tulare Co.; south to San Diego Co. May-June. Also called Bitter Nut.

Geog. note.—The author has collected Styrax officinalis on the banks of the brook of Kishon and on the rocky slopes of Mt. Carmel in Palestine (*Jepson* 11,129). This collection of Styrax officinalis from the Near East, in all particulars of herbage and flowers, differs no more from the shrub named Styrax californica by Torrey than various specimens of Styrax californica do from each other. While the leaves of California shrubs are said to be less pubescent, we have many California specimens in which the leaves beneath are more pubescent than in specimens from the Mediterranean region. Therefore, we hold the California plant to be quite conspecific with that of Asia Minor, as has been done before us by J. Perkins of the Royal Botanic Gardens, Berlin.

Locs.—North Coast Ranges: Soda Bay, Clear Lake, *R. H. Platt;* Indian Valley (mts. e.), ne. Lake Co., *Jepson* 8983; Mud Flat, w. Glenn Co., *Heller* 11,535; Redding, *Blankinship;* Delta, Shasta Co., *Jepson* 6177. Sierra Nevada foothills: Cow Creek Cañon, Shasta Co., *M. S. Baker;* Pitt River, *Lorenzen;* Feather River, *G. C. Bills;* Rattlesnake Bend, Placer Co., *Alice King;* Gwin Mine, Calaveras Co., *Jepson* 1819; Piedra, near Tivy Mt., Fresno Co., *H. P. Kelley* (leaves large, cordate at base); Kaweah, *Hopping.* S. Cal.: Waterman Cañon, San Bernardino, *Jepson* 5551; Trabuco Cañon, Santa Ana Mts., *Peirson* 3493; betw. Pala Mission and Fallbrook, *Evelyn Gray;* Nigger grade, Palomar Mt., *C. V. Meyer* 495; Mesa Grande, San Diego Co., *E. Ferguson* 65.

Var. **fulvescens** M. & J. Petioles rusty-tomentose; leaves often cordate at base; calyx-border sometimes more strongly denticulate.—Santa Barbara Co.: Painted Cave Ranch; San Marcos Pass, Santa Inez Mts., *J. R. Hall.* A rather immaterial variety.

Refs.—Styrax officinalis L., Sp. Pl. 444 (1753), type from Syria. *S. californica* Torr., Smithson. Contrib. 6:4 (1853), type loc. upper Sacramento River (probably in the cañon), *Fremont.* *S. officinalis* var. *californica* Rehd., Mitt. Deutsch. Dendr. Gesellsch. 24:226 (1915); M. & J., Bull. Torr. Club 51:298 (1924); Jepson, Man. 758, fig. 739 (1925). Var. fulvescens M. & J., Bull. Torr. Club 51:297 (1924). *S. californica* var. *fulvescens* Eastw., Bot. Gaz. 41:286 (1906), type loc. near Painted Cave Ranch, Santa Inez Mts., *Eastwood.*

OLEACEAE. Ash Family

Trees or shrubs. Leaves opposite or sometimes alternate, deciduous in ours. Flowers small, commonly in compact panicles or clusters, mostly unisexual, sometimes perfect. Corolla sympetalous, choripetalous or none. Stamens few (1 to 4). Ovary superior, 2-celled; style 1. Fruit a samara, capsule or drupe.—This family includes Forsythia, Lilac, Olive and Privet of the gardens.—Genera 20, species about 380, all continents.

Bibliog.—Gray, A., Revision of the genus Forestiera (Proc. Am. Acad. 4:363–6,—1860). Wenzig, Th., Die Gatt. Fraxinus (Engler, Bot. Jahrb. 4:165–188, t. 2, 3,—1883). Sterrett, W. D., The ashes: their characteristics and management (U. S. Dept. Agr. Bull. 299:1–88, pls. 1–16,—1915). Lingelsheim, A., Oleaceae-Oleoideae (Engler, Pflzr. $4^{243-1-2}$:1–125, figs. 1–22,—1920). Steyermark, J. A., A revision of the genus Menodora (Ann. Mo. Bot. Gard. 19:87–176, figs. 1–6 and pls. 4–11,—1932).

Leaves compound, opposite; fruit a samara........1. Fraxinus.
Leaves simple; fruit not a samara.
  Fruit a drupe; leaves opposite........2. Forestiera.
  Fruit a circumscissile capsule; leaves mostly alternate, entire........3. Menodora.

1. FRAXINUS L. Ash

Trees or shrubs. Leaves deciduous, pinnately compound. Flowers dioecious, perfect or polygamous, borne in small crowded panicles, appearing just before the leaves and from separate buds. Calyx small, truncate, with toothed border. Corolla with 2 equal petals or none. Stamens 2 (rarely 1 or 3). Ovules 2 in each cell. Fruit a 1-seeded samara, with terminal wing.—In F. anomala the leaves are usually simple.—Species about 39, North America, Asia and Europe. (The Latin name of the ash.)

Trees; corolla none; style conspicuously 2-lobed.
  Flowers dioecious; leaves pinnate; leaflets 2 inches long or more; branchlets terete.
    Leaflets oblong to oval, the lateral commonly sessile; wing narrowed or decurrent downward on each side of the body of the fruit, the body therefore clavate; Sierra Nevada and Coast Ranges mainly........1. *F. oregona.*
    Leaflets lanceolate to oval, the lateral on petiolules ½ to 6 lines long; wing strictly terminal, not decurrent on the body of the fruit, the body nearly cylindric; S. Cal. mts........2. *F. velutina.*
  Flowers polygamous; leaves simple, rarely with 2 or 3 leaflets; branchlets of the season 4-sided; e. Mohave Desert........3. *F. anomala.*
Shrub; corolla present; flowers perfect; style obscurely lobed; leaflets mostly stalked, less than 2 inches long; branchlets of the season 4-sided; cismontane........4. *F. dipetala.*

1. **F. oregona** Nutt. Oregon Ash. Tree 30 to 80 feet high; shoots of the season, leaflets beneath and rachises pubescent or puberulent, more or less glabrate; leaves 6 to 12 inches long; leaflets 5 to 7 (or 9), oblong to oval, or often broadest toward the apex and abruptly short-pointed, usually sessile except the terminal one, entire or toothed above the middle, 2 to 5½ inches long; stamens 2 (sometimes 1 or 3); samaras oblong-lanceolate, 1¼ to 1¾ inches long, the wing 2½ to 4 lines wide, narrowly decurrent on the body, the body therefore clavate, 6 to 7 lines long.

Along streams in cañons or valleys, or in lake "bottoms," 10 to 4000 feet: Coast Ranges from Santa Clara Co. to Siskiyou Co.; delta region of the Great Valley; Sierra Nevada from Tulare Co. to Shasta and Modoc Cos. North to British Columbia. Apr.-June, fr. July-Oct.

Field note.—While Fraxinus oregona is closely restricted to very definite habitats along streams and in moist spots, it is, nevertheless, rather frequent in the North Coast Range country. On the flats of the lake "bottom" in Little Lake Valley, Mendocino Co., it formed at one time a considerable forest. In other places it is abundant enough to be of economic importance, since the heavy and hard timber has been used for wagon frames, furniture and barrels.

As to the distribution of Fraxinus oregona it is not known to us in the Coast Ranges south of Santa Clara County but it will probably be found in the Santa Lucia Mountains, or with less likelihood in the mountains of Santa Barbara County. It has long been attributed to cismontane

Southern California (Sargent, Man. Trees N. Am. 777; Sudworth, Forest Trees Pac. Slope, 425; Parish, Zoe 4:344), specimens of Fraxinus velutina and its var. coriacea having been misdetermined as Fraxinus oregona. The best distinction between Fraxinus oregona and Fraxinus velutina resides in the fruit. The wing of the fruit in F. oregona extends to the base of the body, much narrowed to be sure, often almost obsolete, but still observable. The fruit in F. velutina is winged only at the summit; the body is unwinged and rounded or cylindric in a way which F. oregona never is. Both Fraxinus velutina and its variety coriacea are rather rare in Southern California and infrequently met with in the field, both as to cismontane and transmontane areas.

Fraxinus velutina is extremely variable in outline of leaflets, but the fine villous tomentulum on the under surface of the leaflets is usually unmistakable. As to the variety coriacea one can collect in an extremely narrow area on Ash Creek, Owens Lake, a striking diversity of leaflet form. Even so, neither of these compare in range of leaf variation with Fraxinus oregona as it occurs in Napa Valley and elsewhere in the North Coast Range country.

Locs.—Coast Ranges: Gilroy, *Jepson* 14,603; Walnut Creek, *Jepson;* Mt. Tamalpais, *Jepson* 14,601; Cordelia, *Jepson* 3079; St. Helena, *Jepson* 508; Guerneville, *Jepson* 2364; Mill Creek, Ukiah, *Jepson;* Tomki Creek, e. Mendocino Co., *Jepson* 14,600; Briceland, Humboldt Co., *Jepson* 2205; Trinity River Valley at Willow Creek, *Tracy* 8414; Redding, *Blankinship;* Dunsmuir, Shasta Co., *Geo. B. Grant* 5181; Cottage Grove, Klamath River, *Jepson.* Lower San Joaquin Valley: Dry Creek, Modesto, *Hoover* 3879; Stockton. Sacramento Valley: Rio Vista; Walnut Grove, Tyler Isl., *Jepson* 14,606. Sierra Nevada: North Tule River, *Purpus* 1711; North Fork Kaweah River, *Jepson;* El Portal, Mariposa Co., *Jepson;* Berry Creek, Butte Co., *Jepson;* Belden, Plumas Co., *Jepson;* Middle Creek sta., Shasta Co., *Heller* 7956; Egg Lake, Modoc Co., *M. S. Baker.*

Refs.—FRAXINUS OREGONA Nutt., Sylva 3:59, t. 99 (1849), type loc. "Oregon territory," *Nuttall;* Jepson, Fl. W. Mid. Cal. 385 (1901), ed. 2, 319 (1911), Silva Cal. 278 (1910), Trees Cal. ed. 2, 230 (1923), Man. 759, fig. 740 (1925).

2. **F. velutina** Torr. ARIZONA ASH. Tree 15 to 30 feet high; shoots of the season and rachises villous or puberulent, the leaflets beneath villous-tomentulose or puberulent, above glabrous or nearly so; leaflets 5, lanceolate to narrowly ovate, oval or obovate, acute or less commonly attenuate, 1¼ to 4 inches long; samaras 1 to 1½ inches long, the wing 1¼ to 3½ lines wide, not decurrent on the body or rarely weakly on upper portion, the body therefore essentially cylindric.

Cañon sides and bottoms, 250 to 2500 feet: San Gabriel Mts.; San Jacinto Mts.; Cuyamaca Mts. East to Arizona. May, fr. July-Nov.

Locs.—West Fork San Gabriel River, San Gabriel Mts., *Peirson* 2459; Kenworthy (e. of), San Jacinto Mts., *Hall* 959; Warner Pass, e. San Diego Co., *R. W. Sumner;* near Mountain Sprs., e. San Diego Co., *R. W. Sumner.* The petiolules of the two last-cited spms. are as long as those of the var. coriacea. In the species the lateral nerves of the leaflets are weaker and less straight than in the leaflets of the var. coriacea.

Var. **coriacea** Rehd. Shoots of the season and rachises glabrous; leaflets 3 to 7, oval or round-ovate to narrowly lanceolate, often abruptly acute or attenuate, glabrous or slightly puberulent beneath, the lateral nerves straight, regular, sharply defined; samaras similar to those of the species, 11 to 14 lines long, the wing 2¼ to 2¾ lines wide.—Cañons and along streams, 600 to 4000 feet: Cuyamaca, San Jacinto, San Bernardino and San Gabriel mountains; north to the Sierra Nevada in Kern Co. and to Inyo Co. East to Nevada and Utah.

Locs.—Cuyamaca, *R. W. Sumner;* above Ribbonwood, betw. Piñon Flat and Vandeventer Flat, Santa Rosa Mts., *Clary* 1206; Palm Cañon of San Jacinto Mts., *Jepson* 14,599; Pipe Creek, Kenworthy, *Munz* 5810; Santa Ana River near Corona, *Johnston* 1804 (doubtless a waif); San Bernardino, *Parish;* Lytle Creek, San Gabriel Mts., *Peirson* 2144; Victorville, *Parish* 10,547; Onyx, South Fork Valley, Kern Co., *E. W. Voegelin* 24; Greenhorn Mts., *Purpus* 5555; Ash Creek, Owens Lake, *Jepson* 5130.

Refs.—FRAXINUS VELUTINA Torr.; Emory, Mil. Reconn. 149 (1848), type loc. "betw. the waters of the [Rio Grande] Del Norte and the Gila" rivers; Jepson, Silva Cal. 279 (1910), Trees Cal., ed. 2, 230 (1923), Man. 759 (1925). Var. CORIACEA Rehd., Proc. Am. Acad. 53:206 (1917); Jepson, Trees Cal. 230 (1923), Man. 759 (1925). *F. coriacea* Wats., Am. Nat. 7:302 (1873), type loc. Ash Mdws., Nev., *Wheeler;* Jepson, Silva Cal. 279 (1910). *F. oregona* var. *glabra* Lingelsh.; Engler, Pflzr. $4^{243-1-2}$:43 (1920). From the citations and synonymy it is to be observed that Watson's F. coriacea was independently reduced by three different authors, Rehder, Lingelsheim and the writer.

3. **F. anomala** Torr. DWARF ASH. Tree 15 to 20 feet high, or a low spreading shrub; leaves simple, the blade roundish or broadly ovate, 1½ to 2 inches long, or compound with 2 or 3 similar leaflets; flowers perfect and pistillate; samaras with an oblong rounded wing which surrounds the body, 8 to 9 lines long and 4 to 5 lines wide.

Desert ranges, 5000 to 11,000 feet: Inyo Co. and eastern Mohave Desert. East to Colorado and Texas. May, fr. July.

Geog. note.—Fraxinus anomala reaches its western limits on the eastern desert borders of California and is known only from a few stations: Telescope Peak, Panamint Range, *Jepson* 7017; Gilroy Cañon, Providence Mts., *Jepson* 18,230. At both these stations the species is represented by one or a few individuals and there is no present evidence of extension of area by seedlings. The station in Gilroy Cañon is a favorable spot in the cañon bottom protected from intense insolation by a high south wall where the original individual has been replaced by a circle of root-crown sprouts, the circle being 8 feet in diameter. The sprouts were, in 1937, 12 feet high with stem diameters of 1 to 3 inches at 4 inches above the ground.

Refs.—FRAXINUS ANOMALA Torr.; Wats., Bot. King 283 (1871), type from Utah, *Newberry;* Jepson, Silva Cal. 280 (1910), Trees Cal. ed. 2, 139 (1923), Man. 759 (1925).

4. **F. dipetala** H. & A. FOOTHILL ASH. Shrub 5 to 15 (or 22) feet high; herbage glabrous or nearly so; leaves 2 to 6 inches long; leaflets 3 to 9, serrate above the middle, 3/4 to 1 1/2 (or 2 1/4) inches long; petals 2, white, about 3 lines long; samaras oblong, 3/4 to 1 1/4 inches long, 3 to 3 1/2 lines wide, the wing frequently notched at tip.

Cañon sides and mountain slopes, 400 to 3700 feet: Sierra Nevada from Shasta Co. to Tulare Co.; inner North Coast Range from Siskiyou Co. to Solano Co.; South Coast Ranges from Contra Costa Co. to San Luis Obispo Co.; coastal Southern California south to Orange Co. Apr.-May, fr. June-Aug.

Field note.—This species is sometimes distinctly arborescent and is a showy species when the panicles are in full flower. For this reason it is sometimes called Flowering Ash, since it differs markedly in this from our arboreous species with their inconspicuous flowers. The center of distribution from the standpoint of abundance, size of individuals and uniformity of character is, perhaps, on the west side of the San Carlos Range in San Benito County. It also attains a large size on the Arroyo Seco in the Santa Lucia Mts., where individuals 22 feet high and 4 inches in trunk diameter have been found (Jepson Field Book 24:98. ms.).

Locs.—Sierra Nevada: betw. Fourteen Mile House and Forest Ranch, Butte Co., *Heller* 11,405; Kinsley, Mariposa Co., *Hoak;* betw. North Fork and Fish Creek, San Joaquin River, Madera Co., *Jepson* 12,876; Davis Ranch to Watson Spr., North Fork Kaweah River, *Jepson* 571; Grouse Valley, Tulare Co., *Jepson;* North Tule River, *Purpus* 1712. Coast Ranges: Dunsmuir, *L. E. Smith;* Hough's Sprs., ne. Lake Co., *Jepson;* Weldon Cañon, Vaca Mts., *Jepson* 2187; Arroyo Seco, Santa Lucia Mts., *Jepson;* Paso Robles, *Benj. Cobb;* Waltham Creek, sw. Fresno Co., *Jepson.* S. Cal.: Los Olivos, *Virginia P. Fox;* Zaca Lake, Santa Barbara Co., *Condit;* Ojai, *Olive Thacher;* Pacoima Cañon, San Gabriel Mts., *Peirson* 383; Mill Creek Cañon, San Bernardino Mts., *Parish* 2033; Santa Ana River Cañon, Santa Ana Mts., *J. T. Howell.*

Refs.—FRAXINUS DIPETALA H. & A., Bot. Beech. 362 (1841), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 385 (1901), ed. 2, 319 (1911), Silva Cal. 280 (1910), Man. 759 (1925).

2. FORESTIERA Poir.

Shrubs with opposite simple leaves. Flowers inconspicuous, dioecious or polygamous, few in a small panicle. Calyx minute or obsolete. Corolla none, or rarely 1 or 2 small petals. Stamens 2 to 4. Ovules 2 in each cell; style slender. Drupe 1-seeded.—Species 14, North and South America. (M. Forestier, a French physician.)

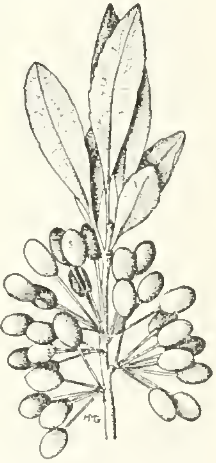

Fig. 327. FORESTIERA NEO-MEXICANA Gray. Fruiting branchlet, × 3/4.

1. **F. neo-mexicana** Gray. DESERT OLIVE. (Fig. 327.) Glabrous shrub with spiny branchlets, 5 to 14 feet high; bark smooth, light gray or yellowish; leaves often fascicled, the blades obovate to oblong, acute, serrulate above the cuneate base or entire, 1/2 to 1 1/2 inches long, the petiole 1 to 3 lines long; flowers in sessile clusters; drupe blue-black, ovoid, 3 to 4 lines long.

Valley flats and mountain cañons, 150 to 5500 feet: South Coast Ranges; Mohave Desert and its bordering ranges; San Jacinto Mts.; Inyo Co. East to Colorado and Texas. Apr.-May, fr. Aug.-Oct.

Locs.—Nortonville, Contra Costa Co.; Mt. Diablo (ridge west of Mt. Zion), *Bowerman* 3414; Arroyo Mocho, Mt. Hamilton Range; Pacheco Pass, *Jepson* 17,004; Pinnacles, Monterey Co., *H. A. Dutton;* Soledad, Salinas River, *Hickman;* Paso Robles, *Barber;* Lancaster, *Davidson;* Mint Cañon, n. of Santa Clara River, Los Angeles Co., *E. E. Allen;* Rock Creek, San Gabriel Mts., *Peirson* 483; Palm Cañon, San Jacinto Mts., *Jepson* 1340; Santa Rosa Mts. (10 mi. se. of Kenworthy), *Clary* 965; Cameron sta., Tehachapi Mts., *Jepson* 15,880; Ord Mt., Mohave Desert, *Jepson* 5890; Barnwell, New York Mts., *K. Brandegee;* Lone Pine, *Jepson* 5138; Alabama Hills, Inyo Co., *Jepson* 911; Coso Mts., Inyo Co., *Ferris* 7864.

Refs.—FORESTIERA NEO-MEXICANA Gray, Proc. Am. Acad. 12:63 (1876); Jepson, Man. 760 (1925). *F. acuminata* var. *parvifolia* Gray, Proc. Am. Acad. 4:364 (1860), type loc. near Santa Fé, N. Mex., *Fendler* 547. *Adelia parvifolia* Cov., Contrib. U. S. Nat. Herb. 4:148 (1893).

3. **MENODORA** H. & B.

Low desert shrubs. Leaves simple, sessile or subsessile, the upper alternate, the lower often opposite. Flowers perfect. Calyx deeply cleft into 5 to 10 linear or subulate lobes. Corolla 5 (or 6)-lobed. Stamens 2. Ovules 4 in each cell; style slender. Fruit deeply 2-parted, each lobe splitting around the middle horizontally (the upper part falling as a lid) or sometimes splitting irregularly; seeds usually 2 in each cell.—Species 15, North and South America, Africa. (Greek menos, force, and doron, gift.)

Corolla-lobes ⅓ to ¼ as long as the tube; flowers shortly peduncled or subsessile, solitary or somewhat fascicled on the short branchlets..........1. *M. spinescens.*
Corolla-lobes longer than the tube; flowers few in a terminal corymb.
  Herbage glabrous..........2. *M. scoparia.*
  Herbage scaberulous-puberulent..........3. *M. scabra.*

1. **M. spinescens** Gray. GROUND THORN. Shrub with very divaricate branches and short stout spiny branchlets, ½ to 2, rarely 3 feet high; branches minutely puberulent; leaves alternate, the blades linear to spatulate-oblong, 3 to 6 lines long on the flowering branchlets, fascicled and often reduced to mere scales on the main stems; flowers solitary or clustered, on peduncles 1 to 6 lines long; calyx-lobes 5 and equal (or 6 or 7 and more or less unequal); corolla white, brown-purple tinged outside, funnelform, 3 to 7 lines long, the limb 3 to 4 lines broad and with short broad lobes; capsule yellowish, its lobes globose, 3 lines in diameter, diverging and, indeed, almost separate.

Plains and stony slopes, 2300 to 5500 feet: eastern Mohave Desert; Inyo Co. East to southern Nevada. Apr.-May.

Locs.—Calico Wash, ne. of Barstow, *Jepson* 5415; Coolgardie Yucca Mesa, *Jepson* 6635; New York Mts., *Jepson* 5467; Argus Mts. (Bot. Gaz. 65:340); Lee Flat, n. of Darwin, acc. *J. Grinnell;* Westgard Pass, *Ferris & Baeigalupi* 8060.

Refs.—MENODORA SPINESCENS Gray, Proc. Am. Acad. 7:388 (1868), type loc. se. Nevada, *Anderson;* Jepson, Man. 760, fig. 742 (1925). *M. spinescens* var. *mohavensis* Stym., Ann. Mo. Bot. Gard. 19:155 (1932), type loc. Barstow (14 mi. ne.), *Parish* 9795, a larger-flowered form.

2. **M. scoparia** Engelm. Branches of the season slender, elongated, erect, more or less clustered, from a woody base, 10 to 15 inches high, not spinescent, sparsely leafy except at base; leaf-blades linear or lanceolate, or the lower obovate; calyx-lobes 7 or 8; corolla yellow, almost rotate, 4 to 6 lines long, its lobes ovate, exceeding the tube; lobes of the capsule globose, not diverging.

Dry gravelly hills, 1500 to 3500 feet: eastern Mohave Desert; western Colorado Desert. East to Arizona, south to Mexico. May-June.

Locs.—New York Mts., near Leastalk, *Parish* 10,260; Providence Mts., *T. Brandegee;* San Felipe (Ann. Mo. Bot. Gard. 19:148); Jacumba, e. San Diego Co., *Abrams* 3641.

Refs.—MENODORA SCOPARIA Engelm.; Gray, Bot. Cal. 1:471 (1876), type loc. "se. borders of Cal.," *Cooper, Palmer;* Jepson, Man. 761 (1925).

3. **M. scabra** Gray. Near no. 2; stems erect, numerous from a woody base or root-crown, 5 to 12 inches high, not spinescent; leaf-blades lanceolate or oblanceolate to linear, 4 to 11 lines long; calyx-lobes 5 to 10; corolla bright yellow, 4 to 5 lines long, its lobes obtuse, its tube 1 line long, slightly short-hairy inside at apex.

Rocky soil, 4000 to 5000 feet: Providence Mts., eastern Mohave Desert. East to Colorado and Texas, south to Mexico. May.

Locs.—Mitchells Caverns, Providence Mts., *Jepson* 18,169. A form (var. laevis Steyerm.) with shorter and broader (or ovatish) leaves and acute corolla-lobes is found in the New York Mts. (Barnwell, *K. Brandegee*) and east to Texas.

Refs.—Menodora scabra Gray, Am. Jour. Sci. ser. 2, 14:44 (1852), type from N. Mex., *Wislizenus, Fendler* 693, *Wright* 563; Jepson, Man. 761 (1925). Var. laevis Steyerm., Ann. Mo. Bot. Gard. 19:137 (1932). *M. laevis* Woot. & Sta., Contrib. U. S. Nat. Herb. 16:158 (1913), type loc. Organ Mts., N. Mex., *Vasey.*

GENTIANACEAE. Gentian Family

Glabrous herbs with a colorless bitter juice. Leaves simple and entire, the cauline opposite and sessile, the basal or lower sometimes drawn down to a petiole or petiole-like base, in Menyanthes the leaves all basal and 3-foliolate. Flowers perfect, regular. Calyx persistent, 4 or 5-toothed or -parted. Corolla 4 or 5-lobed or -parted, usually withering-persistent, its lobes commonly convolute in the bud. Stamens inserted on the tube or throat of the corolla, as many as its lobes. Ovary superior, 1-celled, with 2 parietal placentae; style 1 or none; stigmas 2. Fruit a 2-valved septicidal capsule, the incurved edges of the valves bearing the seeds. Embryo minute, terete, in copious endosperm.—Eustoma is rarely 6-merous. A few Swertias are puberulent and several have whorled leaves.—Genera 64, species about 750, all continents and all climates.

Bibliog.—Grisebach, A. H. R., Genera et species Gentianarum, 1–364 (1839). Huxley, T. H., The Gentians: notes and queries (Jour. Linn. Soc. 24:101–124, pl. 2,—1887). Engelmann, Geo., Papers on Gentianeae (Collected Works, 478–487,—1887). Greene, E. L., N. Am. species of Amarella (Lflts. 1:53–56,—1904); Genus Pneumonanthe (l. c. 68–71). Fernald, M. L., Forms of Am. Gentians (Rhod. 19:149–152,—1917). Card, H. H., A revision of the genus Frasera (Ann. Mo. Bot. Gard. 18:245–282,—1931). Lindsey, A. A., Anatomical evidence for the Menyanthaceae (Am. Jour. Bot. 25:485, figs. 1–21,—1938).

Leaves simple, entire, sessile except some basal ones.
  Corolla without glands.
    Corolla salverform; annuals.
      Flowers yellow; anthers unchanged after anthesis..............................1. Microcala.
      Flowers red or pink; anthers twisting spirally after shedding pollen..............................2. Centaurium.
    Corolla campanulate to funnelform, blue or white.
      Style filiform; stamens inserted on the corolla-throat..............................3. Eustoma.
      Style stout, short or none; stamens inserted on the corolla-tube..............4. Gentiana.
  Corolla-lobes with conspicuous fringed glands..............................5. Swertia.
Leaves 3-foliolate; corolla-lobes bearded with white filaments..............................6. Menyanthes.

1. **MICROCALA** Hoffmgg. & Link

Almost minute annual. Stem simple, or with peduncle-like branches terminating in a 4-merous yellow flower. Calyx 4-toothed. Corolla short-salverform, the 4 short stamens inserted on its throat. Anthers cordate-ovate. Stigma of 2 fan-shaped lobes which at length separate.—Species 2, North and South America, Europe and Asia. (Greek mikros, small, and kalos, beautiful.)

1. **M. quadrangularis** Griseb. Tim-wort. Stem commonly 1 to 2 inches high, with 1 to 3 pairs of oval or oblong leaves below, these 1½ to 3 lines long; peduncle naked, quadrangular; calyx short, strongly quadrangular, and seeming as if truncate at base and apex, especially in fruit, when it is 2 to 2½ lines long; corolla deep yellow, the lower half membranous, twice as long as the calyx, open under a sunny sky, closing in afternoon.

Moist flats in the neighborhood of low hills or in open woods, 10 to 1000 feet: west side of the upper Sacramento Valley in Shasta and Tehama Cos.; Humboldt Co. to Alameda and Santa Cruz Cos. (mostly in the outer Coast Range); Sierra Nevada foothills and their near plains borders from Calaveras Co. to Merced Co. South America. Mar.-May.

Locs.—Shasta Co.: Redding, *Blankinship;* Olinda, *Blankinship;* Anderson, *Alice King.* Tehama Co.: Henleyville (10 mi. w. of Corning), *Virginia Bailey.* Coast Ranges: Hydesville, Humboldt Co., *Tracy* 3583; Dobbyn Creek, Blocksburg region, Humboldt Co., *Tracy* 13,902; Mendocino-Noyo coastal plain, *Bolander* 4726; Ukiah, *Lemmon;* Corte Madera, Marin Co., *Heller* 7368; Martinez, *Chesnut & Drew;* Pt. Richmond, Contra Costa Co., *Davy* 6516; Thousand Oaks, Berkeley, *Jepson;* Santa Cruz, *Anderson.* Sierra Nevada foothills and their bordering rolling plains: Kentucky House, South Fork Calaveras River, *Jepson* 10,040; Copperopolis, Calaveras Co., *Tracy* 5591; Oakdale (4 mi. s.), *Hoover* 491; Snelling, Merced Co., acc. *Hoover.*

Refs.—MICROCALA QUADRANGULARIS Griseb.; DC., Prodr. 9:63 (1845); Jepson, Fl. W. Mid. Cal. 380 (1901), ed. 2, 321 (1911), Man. 761 (1925). *Gentiana quadrangularis* Lam., Dict. 2:645 (1790), type loc. Lima, Peru, *Dombey.*

2. **CENTAURIUM** Hill.

Low erect leafy annuals with sessile leaves. Flowers 5 or sometimes 4-merous, in cymes. Calyx deeply parted, its lobes narrow, carinate. Corolla salverform, pink or rose-color, the stamens inserted on its throat. Filaments slender; anthers twisting spirally after shedding their pollen and commonly exserted. Style filiform, deciduous; stigmas oblong to fan-shaped. Capsule oblong-ovate to fusiform, 1-celled, but the seed-bearing edges of the valves more or less approximate in the center. Seeds oblong or spherical, reticulate-pitted.—Species about 20, North and South America, Europe, Asia and Africa. (Latin centum, a hundred, and aurium, gold piece, certain species valued medicinally.)

Basal leaves in a dense tuft; outer North Coast Range........................1. *C. umbellatum.*
Basal leaves not tufted.
  Anthers oblong; corolla-lobes 1/3 to 1/4 as long as the tube.
    Flowers all on pedicels.
      Corolla-lobes oblong, 1 to 2 lines long; pedicels slender; cismontane S. Cal. (infrequent) and transmontane deserts........................2. *C. exaltatum.*
      Corolla-lobes ovate to broadly oblong, 2 to 3 lines long; pedicels stoutish; coastal (Mendocino Co. to Santa Barbara Co.)........................3. *C. muhlenbergii.*
    Flowers in the forks sessile or subsessile, the others sessile or shortly pediceled; corolla-lobes 1 to 2 lines long; North Coast Ranges, Sacramento Valley and n. Sierra Nevada foothills........................4. *C. floribundum.*
  Anthers linear; corolla-lobes mostly 3 to 7 lines long, 1/2 to nearly as long as the tube; flowers pediceled to subsessile.
    Stigmas spatulate-fanshaped; style very shortly branched; S. Cal. and Sierra Nevada....5. *C. venustum.*
    Stigmas short, not spatulate; style not branched; Coast Ranges............6. *C. trichanthum.*

1. **C. umbellatum** Gilib. EUROPEAN CENTAURY. Stems erect, strictly branched, 10 to 16 inches high, the branches ending in dense cymes; basal leaves in a dense tuft, the blades broadly oblong, 1 to 1¾ inches long, 5 to 8 lines wide; blades of the cauline leaves mostly lanceolate or oblong-lanceolate, ¾ to 1½ inches long; flowers numerous, nearly sessile; corolla rose-color, its lobes ovate, obtusish or subacute, 2¼ to 2¾ lines long, about ½ as long as the tube; stigmas oval.

Introduced European species, naturalized on dry flats or sand bars, 10 to 500 feet: near the coast, Mendocino Co. to Del Norte Co. July-Aug.

Locs.—Little Lagoon, Big River, Mendocino Co., *Jepson* 17,800; Fort Bragg, *W. C. Mathews* 143; Dobbyn Creek, Blocksburg region, Humboldt Co., *Tracy* 13,347; Myers, South Fork Eel River, *Jepson* 12,361; Bull Creek, South Fork Eel River, *Jepson* 16,424; Blue Slide, Van Duzen River, *Tracy* 9610; betw. Willow Creek and Hupa, *Jepson* 2022; Wakefield, 4 mi. n. of Crescent City, *Jepson* 9386.

Refs.—CENTAURIUM UMBELLATUM Gilib., Fl. Lithuanica 1:35 (1781). *Gentiana centaurium* L., Sp. Pl. 229 (1753), type from Europe. *Erythraea centaurium* Pers., Syn. 1:283 (1805).

2. **C. exaltatum** Wight. DESERT CENTAURY. Stem very slender, very strict, (3 or) 8 to 14 inches high; blades of the basal leaves oblong, 4 to 15 lines long, those of the cauline lanceolate to linear, 5 to 12 lines long; flowers on elongated (½ to 2¼ inches long) pedicels in a loose cyme; corolla pale pink, 6 to 7 lines long, its lobes 1 to 2 lines long.

Moist soil along water courses and about springs, 3700 to 4800 feet: cismontane Southern California; San Gabriel Mts., north side; east side of the Sierra Nevada from Inyo Co. to Lassen Co. North to Washington, east to Utah. July.

Locs.—S. Cal.: San Pasqual, San Diego Co., *S. B. & W. F. Parish;* Los Angeles River, *Braunton;* San Bernardino Valley, *Parish* 5897; Pallett Creek, n. side San Gabriel Mts., *Peirson* 2482. East side of the Sierra Nevada: Owens Lake, *Jepson* 5094; Beckwith Pass, Lassen Co., *Jepson* 7759; Honey Lake Valley, *Davy* 3392.

Refs.—Centaurium exaltatum Wight; Piper, Contrib. U. S. Nat. Herb. 11:449 (1906); Jepson, Man. 762 (1925). *Cicendia exaltata* Griseb.; Hook., Fl. Bor. Am. 2:69 (1840), type loc. betw. Kettle Falls and Narrows, Columbia River, *Douglas*. *Erythraea exaltata* Cov., Contrib. U. S. Nat. Herb. 4:150 (1893). *E. douglasii* Gray, Bot. Cal. 1:480 (1876).

3. **C. muhlenbergii** Wight. Monterey Centaury. Stems simple or branched (only occasionally or partially dichotomous), 2 to 6 (or 9) inches high; leaf-blades oblong-ovate to lanceolate, 4 to 10 lines long, the basal or lower ones usually ovate to elliptic, often shorter than those above; flowers terminal on the branches or borne in the forks, all on pedicels, the pedicels $\frac{1}{6}$ to 1 (or $1\frac{1}{2}$) inches long; corolla pink with yellowish throat, 6 to 8 lines long, its lobes ovate to broadly oblong, obtuse, 2 to 3 lines long; stigmas fan-shaped or almost reniform.

Valley flats, sea-bluffs or cañon bottoms, 10 to 500 feet: along the coast from Mendocino Co. to Santa Barbara Co. May-June.

Locs.—Mendocino coast bluffs at Pudding Creek, *Jepson* 17,750; betw. Fort Bragg and Glen Blair, *Ottley* 1504; Stanford (foothills near), *C. F. Baker* 877; betw. Gilroy and Corralitos, *Jepson* 14,640; Soquel Cañon, Santa Cruz Co., *Jepson* 14,627; Pajaro Hills, *Chandler* 373; Pt. Joe, Monterey, *Jepson* 9740; Carmel Bay, *E. Ferguson* 294; San Luis Mt., *Summers;* Arroyo Grande, *Condit;* Santa Inez Mts., *Dunn;* Pelican Bay, Santa Cruz Isl., *Jepson* 12,089.

Refs.—Centaurium muhlenbergii Wight; Piper, Contrib. U. S. Nat. Herb. 11:450 (1906); Jepson, Man. 762 (1925), as to coastal plants. *Erythraea muhlenbergii* Griseb., Gen. et Sp. Gent. 146 (1839), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 379 (1901), ed. 2, 320 (1911). *C. exaltatum* var. *davyi* Jepson, Man. 762 (1925), type loc. West Berkeley, *Davy* 596.

4. **C. floribundum** Rob. June Centaury. Stem usually much branched, 2 to 9 inches (rarely 1 to 2 feet) high; leaf-blades narrowly oblong or ovate to ovate-lanceolate, 5 to 12 (or 17) lines long; flowers in the forks sessile or nearly so, the lateral ones shortly pediceled or subsessile; corolla pink, $5\frac{1}{2}$ to 7 lines long, its lobes oval to oblong or ovate-lanceolate, obtuse or retuse, 1 to $1\frac{3}{4}$ (or 2) lines long.

Along water courses and in moist places, 20 to 1500 feet: inner valleys and inner ranges in Mendocino Co.; Sacramento Valley (east side) and bordering Sierra Nevada foothills; lower San Joaquin Valley and bordering Sierra Nevada foothills and inner Coast Range foothills. June-Aug.

Locs.—North Coast Ranges: Hopland, *Jepson* 7624; Ukiah, *Stout;* Covelo ranger sta., *Cronemiller* 644. Sacramento Valley and bordering foothills: Table Mt., Oroville, *Heller* 10,777; Marysville, *Jepson* 16,757. Lower San Joaquin Valley and bordering foothills: Table Mt., Tuolumne Co., *Jepson* 6426; Farmington, San Joaquin Co., *Hoover* 649; Valley Home, Stanislaus Co., *Hoover* 660; upper Del Puerto Cañon, w. Stanislaus Co., *Hoover* 2630.

Refs.—Centaurium floribundum Rob., Proc. Am. Acad. 45:396 (1910). *Erythraea floribunda* Benth., Pl. Hartw. 322 (1849), type loc. east side of the Sacramento Valley, *Hartweg* 405 (typ. vidi). *C. muhlenbergii* Jepson, Man. 762 (1925), as to interior plants.

5. **C. venustum** Rob. Canchalagua. (Fig. 328.) Stem 4 to 8 inches high, almost simple and with few flowers to corymbosely branched with numerous flowers; calyx-lobes reaching to or nearly to corolla throat; corolla 8 to 11 lines long, vermilion or rose-color, the throat white, marked with 5 red spots or crescents; corolla-lobes elliptic to oblong, obtusish or acute, often denticulate at apex, 5 to 7 lines long, $\frac{3}{5}$ to nearly as long as the tube; stigmas spatulate fan-shaped or spoon-shaped, borne on short but distinct branches of the style.

Dry or moist slopes or flats, 200 to 6400 feet: Southern California, common (both cismontane and transmontane); north through the Sierra Nevada from Kern Co. to Butte Co.; inner North Coast Range foothills from Tehama Co. to Shasta Co. June-Aug.

Locs.—S. Cal.: La Jolla, *Evelyn Gray* (fls. sometimes white); Mesa Grande, San Diego Co., *E. Ferguson* 124; Escondido, *C. V. Meyer* 131; Indian Cañon, Collins Valley, ne. San Diego Co., *Jepson* 8844; Glendale, *Braunton* 890; Lower Rubio Cañon, San Gabriel Mts., *Peirson* 144; San Bernardino, *Parish* 4193; Palm Cañon, Mt. San Jacinto, *Jepson* 1366; Palo Verde, e. Riverside Co., *Hall* 5915; Victorville, *Parish;* Ojai Valley, *Olive Thacher.* Sierra Nevada: Kernville, *Purpus* 5652; Kaweah, *Jepson* 562; Orange Cove, Fresno Co., *Hoover* 1272; McKinley Grove., *A. L. Grant* 1194; Mono Hot Sprs., Fresno Co., *A. L. Grant* 1497; Auberry, Fresno Co., *Jepson* 12,882; Arnold Mdw., Madera Co., *A. L. Grant* 1355; Yosemite, *Jepson* 3129; Hetch-Hetchy, *Jepson* 3466; Rancheria Mt., Tuolumne Co., *Jepson* 4606; Burson, Calaveras Co., *Jepson* 9936; Buena Vista, Amador Co., *Jepson* 9960a; Table Mt., Oroville, *Heller* 10,778. Inner North Coast Range foothills: Mud Flat, sw. of Paskenta, Tehama Co., *Heller* 11,523; Olinda, Shasta Co., *Blankinship;* Redding, *Blankinship.*

Refs.—CENTAURIUM VENUSTUM Rob., Proc. Am. Acad. 45:397 (1910); Jepson, Man. 762, fig. 743 (1925). *Erythraea venusta* Gray, Bot. Cal. 1:479 (1876), type from Cal. *E. chironioides* Torr., Bot. Mex. Bound. 156, pl. 42 (1859), in part.

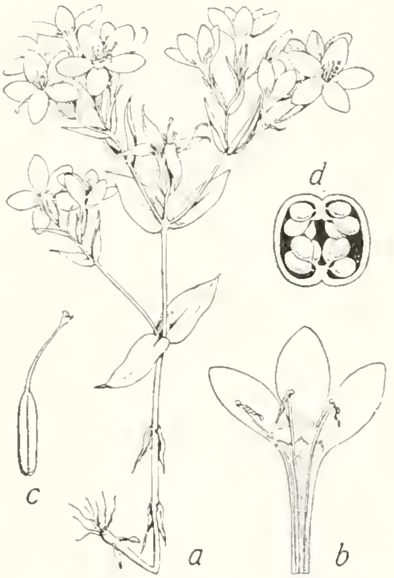

Fig. 328. CENTAURIUM VENUSTUM Rob. *a*, habit, × ½; *b*, long. sect. of corolla, × 1½; *c*, pistil, × 1½; *d*, cross sect. of ovary, × 8.

6. **C. trichanthum** Rob. ALKALI CENTAURY. Stem corymbosely and rather densely branched, 3 to 9 (or 12) inches high, commonly with numerous usually crowded flowers; flowers sessile in the forks, and sessile along the branches or shortly pediceled; leaf-blades broadly oblong and usually acute to lanceolate, ½ to 1 inch long; corolla pink, usually with whitish throat, 6 to 9 lines long, its lobes oblong, acute, becoming narrow in age by involution and thus very acuminate, 2½ to 3 lines long; style not branched, the stigmas short, transversely oblong.

Dry often alkaline ground, 100 to 1600 (or 2600) feet: Santa Cruz Mts. to Siskiyou Co. May-Aug.

Locs.—Belmont, *Davy* 778; Howell Mt., *Jepson* 6836; Calistoga, *Jepson* 7438; betw. Samuels Sprs. and Aetna Sprs., Napa Co., *Jepson* 14,638; Butts Cañon, n. of Pope Valley, Napa Co., *Jepson* 14,633; Devil's Gate, Putah Creek, *Jepson* 14,636; Knoxville grade to Lower Lake, *Jepson* 14,631; Yreka, *Butler* 1020.

Refs.—CENTAURIUM TRICHANTHUM Rob., Proc. Am. Acad. 45:397 (1910); Jepson, Man. 762 (1925). *Erythraea trichantha* Griseb., Gen. et Sp. Gent. 146 (1839), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 379 (1901), ed. 2, 320 (1911).

3. **EUSTOMA** Salisb.

Ours a glaucous perennial herb. Flowers blue or white, long-peduncled, axillary and terminal, 5 or 6-merous. Calyx-lobes long-acuminate, keeled. Corolla campanulate-funnelform, its lobes more or less erose-denticulate. Stamens inserted on the throat of the corolla; anthers straight or recurving in age. Style filiform. Capsule oval to oblong.—Species 3, North and South America. (Greek eu, good, and stoma, mouth, the corolla throat large.)

1. **E. exaltatum** Griseb. MOCK GENTIAN. (Fig. 329.) Erect, 1 to 2½ feet high; leaf-blades broadly oblong, 1½ to 3 inches long, thickish, sessile, subcordately clasping; flowers 1 to 1¼ inches long, on peduncles 1 to 3¼ inches long; corolla blue or deep lavender, 1 to 1¼ inches long, its lobes obovate or oblong, 9 to 10 lines long, twice length of tube; capsule elliptic, 5 to 6 lines long.

Moist sandy flats or alkaline meadows in valleys, 500 to 1500 feet: cismontane Southern California; west side of the Colorado Desert. East to Florida, south to Lower California and Venezuela. Aug.-Dec.

Locs.—Santa Ana Cañon near Olive, Orange Co., *Laura O. Dodge;* San Bernardino, *Parish;* Riverside, *Hall* 2672; Palm Sprs. of San Jacinto, *Gilman* 23; Vallecito, e. San Diego Co., *Jepson* 8535.

Refs.—Eustoma exaltatum Griseb.; DC., Prod. 9:51 (1845). *Gentiana exaltata* L., Sp. Pl. ed. 2, 331 (1762), type American. *E. silenifolium* Salisb., Parad. Lond. t. 34 (1805), type loc. "in Ins. Providence," *M. Catesby;* Parish, Erythea 6:89 (1898); Jepson, Man. 762 (1925).

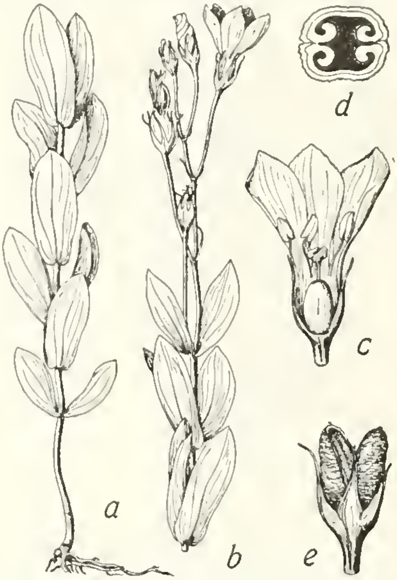

Fig. 329. Eustoma exaltatum Griseb. *a*, base of plant, × ⅓; *b*, upper part of plant, × ⅓; *c*, long. sect. of fl., × 1; *d*, cross sect. of ovary, × 3; *e*, dehiscing capsule, × 1.

4. **GENTIANA** L. Gentian

Herbs with opposite sessile leaves and usually showy flowers. Calyx 4 or 5-cleft. Corolla campanulate or funnelform, commonly blue, the lobes 4 or 5 and often with teeth or plaited folds in their sinuses. Stamens inserted on the tube of the corolla (at the middle or below), included. Style short and persistent, or none; stigmas 2. Capsule oblong, enclosed in the withering-persistent corolla; seeds small, very numerous with a loose cellular or winged coat.—Species about 300, all continents except Africa. (Gentius, king of Illyria, who discovered the tonic properties of these herbs.)

- Annuals or biennials; calyx-tube without an inner membrane.
  - Corolla without teeth or lobes in the sinuses; leaves not white-margined; annuals.
    - Corolla-lobes without a crown at base; flowers solitary; San Bernardino Mts. and Sierra Nevada.
      - Stems several from the base; flowers long-peduncled........1. *G. holopetala.*
      - Stem one and simple; flowers short-peduncled........2. *G. simplex.*
    - Corolla-lobes with a fimbriate crown at base.
      - Flowers clustered; plants 1 to 1½ feet high; cismontane, rarely transmontane in Cal........3. *G. amarella.*
      - Flowers solitary; plants 2 to 4 inches high; transmontane (Inyo and Mono Cos.)....4. *G. tenella.*
  - Corolla with lobes in the sinuses; flowers solitary; leaves white-margined; biennials.
    - Capsule exserted from the corolla on a long stipe; dehiscing at apex and becoming trumpet-shaped; corolla-tube not exceeding the calyx; San Bernardino Mts........5. *G. fremontii.*
    - Capsule included in the corolla, linear-oblong; corolla twice as long as the calyx; White Mts........6. *G. prostrata.*
- Perennials; calyx-tube with an inner membrane which projects slightly above the insertion of the lobes; leaves (at least the lower cauline) with connate sheaths at base 1 to 3 lines long.
  - Alpine dwarf, 1¼ to 2 inches high........7. *G. newberryi.*
  - Stems ½ to 2 feet high, leafy.
    - Uppermost pair of leaves forming an involucre about the terminal 1 to 5-flowered cluster; sinus appendages lacerate.
      - Involucrate leaves united below (at least on one side); corolla-lobes apiculate; North Coast Ranges........8. *G. setigera.*
      - Involucrate leaves scarcely united; corolla-lobes obtuse; Sierra Nevada and Trinity Mts........9. *G. calycosa.*
    - Uppermost pair of leaves often approximating the flowers but quite distinct.
      - Sinuses of the corolla with teeth or lobes.
        - Calyx-lobes oblong to ovate-lanceolate, subequal; North Coast Ranges and Shasta Co........10. *G. oregana.*
        - Calyx-lobes linear to narrow-lanceolate, unequal; Modoc Co........11. *G. affinis.*
      - Sinuses of the corolla without lobes or appendages; north coast........12. *G. sceptrum.*

1. **G. holopetala** Holm. SIERRA GENTIAN. (Fig. 330.) Stems several from the base, 4 to 14 inches high, leafy below and ending above in a long naked 1-flowered peduncle; blades of basal leaves obovate, those of the cauline linear-oblanceolate, acute, ½ to 1½ inches long; calyx ½ to ¾ as long as the corolla, cleft to the middle or below into lanceolate-subulate lobes; corolla blue, 1½ (or 2) inches long, its lobes broad and short (obovatish), entire or erose-denticulate; seeds scaly-roughened.

Moist meadows, 6000 to 11,000 feet: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Tuolumne Co. East to western Nevada, north to Oregon. July.

Locs.—Bear Valley, San Bernardino Mts. (acc. Parish, Pl. World 20:248); Horseshoe Mdw., Inyo Co., *Jepson* 940; Tulare Co., *Jepson* 4679 (Hockett Mdw.), 1162b (Mineral King), 1115 (Poison Mdw., Soda Cañon), 1049 (Junction Mdw., Kern Cañon), 1062a (Mt. Whitney, an acaulescent state resembling G. newberryi); West Vidette, Bubbs Creek, *Jepson* 820; Fish Valley, Fresno Co., *A. L. Grant* 1552; Soda Sprs., North Fork San Joaquin River, *Congdon;* Parker Pass, *A. L. Grant* 1615a, 1614b (subacaulescent); Kennedy Lake, Tuolumne Co., *A. L. Grant* 192.

Refs.—GENTIANA HOLOPETALA Holm, Ottawa Nat. 15:110 (1901); Jepson, Man. 763, fig. 744 (1925). *G. serrata* var. *holopetala* Gray, Bot. Cal. 1:481 (1876), type loc. Tuolumne Soda Sprs., *Brewer* 2847. *G. detonsa* of Cal. authors, not Rottb.

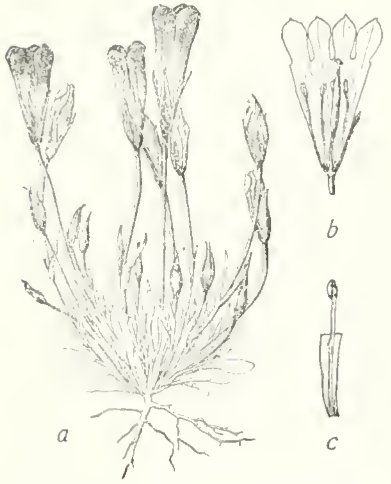

Fig. 330. GENTIANA HOLOPETALA Holm. *a*, habit, × ½; *b*, long. sect. of fl., × ⅔; *c*, stamen, with a portion of the corolla-tube showing the decurrent or adnate base of the filament, × 1.

2. **G. simplex** Gray. HIKERS GENTIAN. (Fig. 331.) Stems always simple, 3 to 12 inches high, bearing 2 to 4 (or 5) pairs of leaves and ending in a single peduncled flower; leaf-blades linear-oblong to lanceolate, 4 to 8 lines long; calyx ½ to ¾ as long as the corolla, cleft to the middle or below, its lobes lanceolate but not subulate-tipped; corolla blue, 1 to 1¼ (or 1½) inches long, its lobes obovatish, rounded, finely toothed all around or subentire; capsule stiped; seeds striate longitudinally, roughened at each end.

Wet meadows, 4000 to 9500 feet: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Tehama Co.; Humboldt Co. to Siskiyou Co. East to western Nevada, north to southern Oregon. July-Sept.

Locs.—San Bernardino Mts.: Bluff Lake, *Grinnell.* Sierra Nevada: Huckleberry Mdw., Giant Forest, *Newlon* 55; Huntington Lake, Fresno Co., *Jepson* 12,974; Kennedy Lake, Tuolumne Co., *A. L. Grant* 193; Dorrington, Calaveras Co., *Jepson* 10,122; Tallac, Lake Tahoe, *Jepson* 8085; Bear Valley, Nevada Co., *Jepson* 14,647; Lake Independence, Nevada Co., *Jepson* 8061; Mineral, Tehama Co., *J. Grinnell.* North Coast Ranges (far north): Sisson, *Jepson* 14,648; Trinity Summit, *Tracy* 5275.

Refs.—GENTIANA SIMPLEX Gray, Pac. R. Rep. 6:87, pl. 16 (1857), type loc. Upper Klamath Lake, near Cal.-Ore. boundary, *Newberry;* Jepson, Man. 763 (1925).

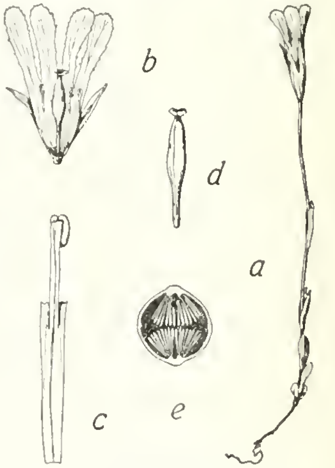

Fig. 331. GENTIANA SIMPLEX Gray. *a*, habit, × ⅓; *b*, fl. spread open, × ½; *c*, stamen, showing portion of corolla-tube with filament decurrent upon it, × 4; *d*, pistil, × 1; *e*, cross sect. of ovary, × 4.

3. **G. amarella** L. var. **acuta** Herder. RANGERS GENTIAN. (Fig. 332.) Stem slender, strictly and sparingly branched, 1 to 1½ feet high; leaf-blades lanceolate

or oblong, ¾ to 1½ inches long, the basal spatulate-obovate, shorter; flowers 1 to 3 in the axils or terminal, on pedicels 3 to 11 lines long; calyx about half as long as the corolla, deeply lobed; corolla tubular, 4 to 6 lines long, its lobes pale or dark blue, about ¼ as long as the tube, bearing below the middle a series of slender fimbriae.

Damp or boggy meadows, 4500 to 8700 (or 10,900) feet: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Plumas Co.; Trinity Mts. North to Alaska, east to New Mexico and Labrador. June-Sept.

Locs.—San Bernardino Mts.: Mill Creek, *R. J. Smith;* Bear Valley, *Edmund Heller;* Bluff Lake, *J. Grinnell* 101. Sierra Nevada: Kern Cañon, *Jepson* 1048; Line Creek, Huntington Lake, *Jepson* 13,084; Tuolumne Mdws., *Bolander* 5045; Tallac, Lake Tahoe, *Jepson* 8088; Truckee, *Sonne;* Jonesville, Butte Co., *Copeland;* Big Mdws., Plumas Co., *R. M. Austin.*

Field note.—In Rock Creek Lake Basin, western Inyo Co., Gentiana amarella var. acuta is abundant and reaches an elevation of about 10,900 feet. The plants are sometimes very small, only 2 or 3 inches high. At certain stations these small plants are the only ones to be found.—F. W. Peirson.

Refs.—GENTIANA AMARELLA L., Sp. Pl. 230 (1753), type European. Var. ACUTA Herder, Act. Hort. Petrop. 1:428 (1872); Jepson, Man. 763 (1925). *G. acuta* Michx., Fl. Bor. Am. 1:177 (1803), type from eastern N. Am. *Amarella copelandii* Greene, Lflts. 1:53 (1904), type loc. Mt. Eddy, *Copeland* 3489. *A. californica* Greene, l.c. 54, Plumas and Butte Cos., *R. M. Austin.* *A. lembertii* Greene, l.c. 54, "Yosemite Valley," *Lembert;* (the collections of J. B. Lembert, though sent from Yosemite Valley, were frequently made above Yosemite, especially at Tuolumne Mdws., where he built a cabin and lived for long).

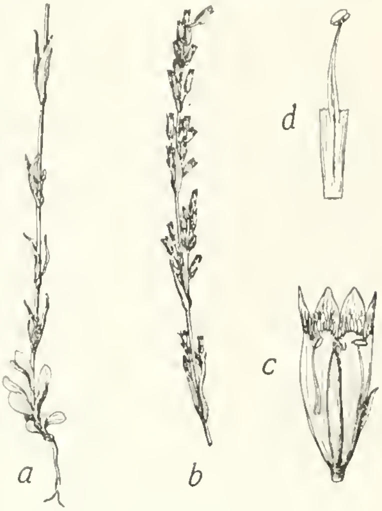

Fig. 332. GENTIANA AMARELLA L. var. ACUTA Herder. *a, b*, habit, × ⅓; *c*, long. sect. of fl., × 3; *d*, stamen with portion of corolla-tube, × 4½.

4. **G. tenella** Rottb. DANES GENTIAN. (Fig. 333.) Stem branched from the base, 2 to 4 inches high; branches ending in long naked 1-flowered peduncles, the leaves basal and subbasal; leaf-blades narrowly obovate to oblong, 3 to 6 lines long; flowers 3½ to 6 lines long; calyx-lobes unequal, slightly more than ½ length of corolla; corolla white, or greenish outside and pale blue inside the lobes, bearing a crown of deeply laciniate scales at the base of the lobes, the lobes about ½ length of the tube, slightly hooded at apex; stamens much shorter than corolla-tube, their filaments almost wholly adnate.

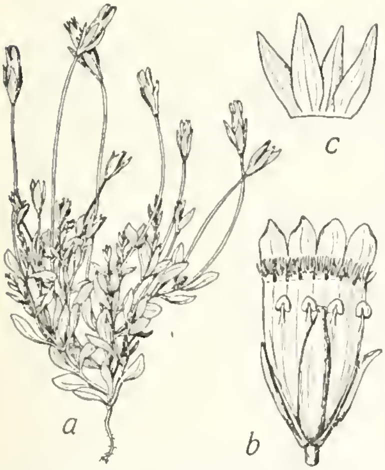

Fig. 333. GENTIANA TENELLA Rottb. *a*, habit, × ⅔; *b*, corolla spread open, with pistil and calyx, × 3; *c*, calyx spread open, × 2.

Moist meadows, 8500 to 11,000 feet: east side of the Sierra Nevada in Inyo Co. Also in the northern White Mts., Nevada. East to Arizona and Colorado, north to Alaska. Arctic regions around the earth. July-Aug.

Geog. note.—In the relative lengths of corolla-lobes, corolla-tube and calyx, and in all other details of the flowers, leaves and habit, our plants correspond closely with plants inhabiting Sweden and other northern countries. The flowers, says F. W. Peirson, are strictly diurnal; in early morning or late afternoon not an open flower can be found. Two California localities are known, Heart Lake, Rock Creek, w. Inyo Co., *Peirson* 9482, and Mirror Lake, Mt. Whitney (Lflts. W. Bot. 1:16), but it has also been found in Esmeralda Co., Nev. (Chiatovitch Creek, n. White Mts., *Duran* 3105).

Refs.—GENTIANA TENELLA Rottb., Act. Hafn. 10:436, t. 2, fig. 6 (1776), type European. *G. monantha* Nels., Bull. Torr. Club 31:244 (1904), type loc. Mirror Lake, Colo., *Frederick Clements* 456.

5. **G. fremontii** Torr. LONE GENTIAN. (Fig. 334.) Stems erect, simple or several from the base, 1½ to 3 inches high, leafy throughout and bearing a single terminal flower; herbage yellowish-green; leaf-blades white-margined, 2 to 3 lines long, the basal round-ovate, the cauline oblong, connate at base; calyx-lobes short, ⅙ length of the tube; corolla tubular, dull white, 4 to 5 lines long, its tube shorter than the calyx; sinus-appendages toothed; capsule exserted on a long stipe at maturity, dehiscent to the middle and becoming trumpet-shaped, 2 lines wide.

Boggy meadows, 7800 to 8700 feet: San Bernardino Mts. East to the Rocky Mts. Asia. Aug.

Loc.—South Fork Santa Ana River, *Peirson* 3136.

Refs.—GENTIANA FREMONTII Torr.; Frem., Rep. First Exped. 94 (1843), type loc. Wind River Mts., Wyo., *Fremont*. *G. humilis* Stev., Act. Mosq. 3:258 (1812), type loc. Siberia; Jepson, Man. 764 (1925); not G. humilis Salisb. (1796). *G. viridula* Parish, Bot. Gaz. 38:461 (1904), type loc. South Fork Santa Ana River, San Bernardino Mts., *C. M. Wilder*.

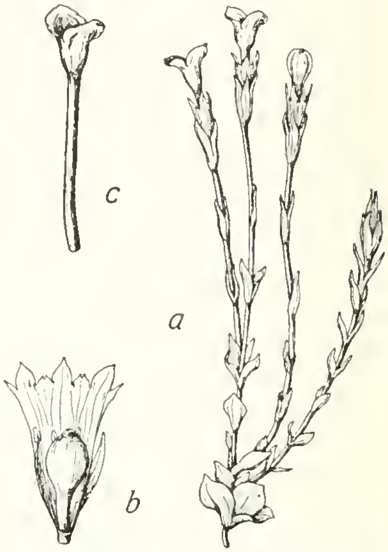

Fig. 334. GENTIANA FREMONTII Torr. *a*, habit, × 1; *b*, long. sect. of fl., × 2; *c*, capsule, × 1½.

6. **G. prostrata** Haenke var. **americana** Engelm. PIGMY GENTIAN. (Fig. 335.) Plants ½ to 2 inches high, often branching at base and the lateral stems decumbent; leaf-blades ovate to oblong, white-margined, ½ to 1 line long, the basal orbicular; flowers solitary and terminal, 4 to 5 lines long; calyx-teeth short, about ⅙ length of the tube; corolla blue, its lobes ovate, acute; sinus-appendages ovate, acute, entire or notched, ⅓ to ½ as long as the corolla-lobes; capsule enclosed in the corolla, linear-oblong.

Meadows, 11,700 to 12,000 feet: White Mts. Rocky Mts. from Colorado to Alberta and north to Alaska. Aug.

Loc.—McAfee Mdw., *Duran*.

Refs.—GENTIANA PROSTRATA Haenke; Jacq., Coll. Bot. 2:66, t. 17 (1788). Var. AMERICANA Engelm., Trans. St. Louis Acad. 2:217, pl. 9, figs. 10–15 (1863), type loc. Mt. Flora, Snowy Range, Colo., *Parry* 306. *Chondrophylla americana* Nels., Bull. Torr. Club 31: 245 (1904).

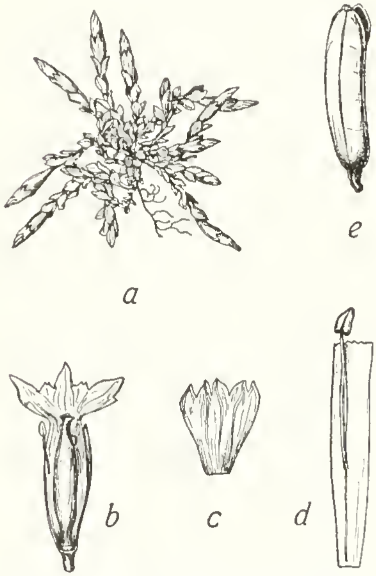

Fig. 335. GENTIANA PROSTRATA Haenke var. AMERICANA Engelm. *a*, habit, × ½; *b*, long. sect. of fl., × 2; *c*, calyx spread open, × 1½; *d*, stamen, with portion of corolla-tube, × 4; *e*, capsule, × 2.

7. **G. newberryi** Gray. ALPINE GENTIAN. Alpine dwarf, the one-flowered stems ¼ to 2 (or 4) inches long; leaf-blades mostly round-obovoid to oblanceolate, narrowed to a short petiole-like base, ½ to 1½ inches long; calyx-tube turbinate, its lobes linear or lanceolate, equaling or longer than the tube; corolla commonly

white inside and greenish-dotted, sometimes pale blue or purple, 1 to 1¼ inches long, commonly twice as long as the calyx, its lobes erect, ovate, acute, very short, with a longitudinal slate-brown band outside; sinus-appendages broad, with 1 or 2 teeth.

Alpine or subalpine meadows, 6600 to 12,000 feet: Sierra Nevada from Mt. Whitney to Lassen Peak; White Mts.; Siskiyou Co. North to southern Oregon. July-Sept.

Geog. note.—While it may occur as scattered individuals on the short-grass plateaus at high altitudes, Gentiana newberryi often forms mat-like colonies 1 to 3 or 4 feet in diameter on dry flats. There is some variation in corolla color, but it has not the significance implied in the literature. Generally, perhaps always, the corolla has broad greenish or slate-brown bands outside. In the southern Sierra Nevada and commonly elsewhere the corolla is white; in the northern Sierra Nevada it is sometimes light blue; on Mt. Eddy in the Salmon Mts. it may be purple.

Concerning distribution of Gentiana newberryi in the north it is important to note that it inhabits Lassen Peak (*Brewer*) and has been found twice on Mt. Eddy at the junction of the Salmon Mts. and Trinity Mts. in the high North Coast Ranges. It thus falls into a special distributional category. That is to say, it belongs in the list of species which are found on the high peaks of the northernmost Sierra Nevada and on the high Coast Range peaks west of Mt. Shasta, but not on Mt. Shasta itself.

Locs.—Sierra Nevada: Mt. Whitney, *Jepson* 1070; Vermilion Valley, Mono Creek, e. Fresno Co., *Jepson* 13,191; Beasore Mdw., Madera Co., *Kennedy;* Parker Pass, Tuolumne Co., *A. L. Grant* 1615; Tuolumne Soda Sprs., *Chesnut & Drew;* Grass Lake near Fallen Leaf, *Jepson* 8160; Summit Valley, Placer Co., *Sonne;* Lake Independence, *Jepson* 8059; Bogard ranger sta., sw. Lassen Co., *Robinson* 68. Inyo and Mono Cos.: White Mts., *Shockley* 571. Siskiyou Co.: Mt. Eddy, *Lemmon.*

Refs.—GENTIANA NEWBERRYI Gray, Proc. Am. Acad. 11:84 (1876), type loc. Crater Pass, s. Ore., *Newberry;* Jepson, Man. 764 (1925). *Pneumonanthe newberryi* Greene, Lflts. 1:71 (1904). *G. copelandii* Eastw., Proc. Cal. Acad. ser. 4, 20:150 (1931), type loc. Mt. Eddy, *Eastwood* 2037 (typ. vidi). *G. eximia* Eastw., Lflts. W. Bot. 1:96 (1934), new name for *G. copelandii* Eastw.

8. **G. setigera** Gray. MENDOCINO GENTIAN. (Fig. 336.) Stems several from the root-crown, ascending, 10 to 12 inches long, bearing terminally one or several flowers; leaf-blades roundish to ovate, obtusish, 1 to 1½ inches long, the uppermost pairs covering the bases of the flowers; calyx-lobes oblong or ovate, about as long as or shorter than the tube; corolla blue, subcampanulate, 1½ to 1¾ inches long, the lobes erosulate, apiculate, nearly as broad as long, the sinus-appendages produced into 2 to 6 capillary bristles nearly as long as the lobes; seeds winged.

Boggy meadows, 4000 to 6500 feet: Mendocino Co. to Siskiyou Co. July-Sept.

Locs.—Red Mt., n. Mendocino Co., *C. P. Bonsall;* Trinity Summit, *Tracy* 5274; Granite Creek, Trinity Co., *Lloyd Austin;* Shackelford Creek, w. Siskiyou Co., *Butler* 1709.

Refs.—GENTIANA SETIGERA Gray, Proc. Am. Acad. 11:84 (1875), type loc. Red Mt., nw. Mendocino Co., *Bolander;* Jepson, Man. 764 (1925).

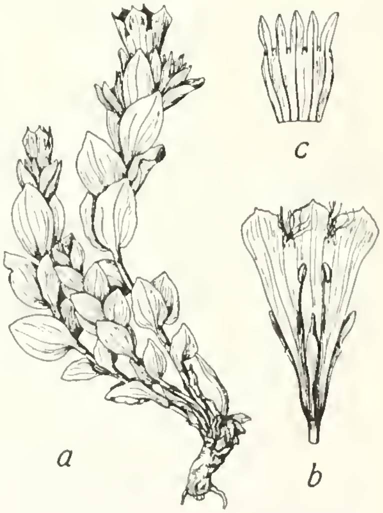

Fig. 336. GENTIANA SETIGERA Gray. *a*, habit, × ⅓; *b*, long. sect. of fl., × ⅔; *c*, calyx spread open, × ⅔.

9. **G. calycosa** Griseb. EXPLORERS GENTIAN. (Fig. 337.) Stems several from a stoutish root-crown, 6 to 12 inches high; leaf-blades ovate, acute, ½ to 1½ inches long; flowers one and terminal or commonly few and shortly pediceled in the uppermost axils, thus forming a close terminal cluster, rarely with one or few supplementary flowers on long pedicels from the axils below; calyx-tube membranous,

broadly oblong, 2 to 3 lines long, its lobes ovate, contracted at base, unequal, about as long as the tube and inserted just below its truncate border; corolla deep blue, 1¼ to 1½ inches long, its lobes short and roundish, obtuse, yellowish-dotted, ¼ as long as the tube; sinus-appendages triangular-subulate, prominent; corolla-tube with 2 greenish-dotted elongated areas beneath each lobe; seeds wingless.

Moist meadows, 4500 to 10,400 feet: Sierra Nevada from Tulare Co. to eastern Siskiyou Co.; Trinity Mts. East to Wyoming, north to British Columbia and Montana. July-Sept.

Locs.—Sierra Nevada: Kern River Cañon, *Culbertson* 4398; Farewell Gap, Tulare Co., *Jepson* 1139; Shadow Lake, Madera Co., *A. L. Grant* 1569; Silver Lake, w. Mono Co., *W. M. Maule;* Mt. Tallac, Eldorado Co., *Jepson* 8134; Emerald Bay, Lake Tahoe, *Rowena Beans;* Downieville Buttes, *Lemmon;* Martin Sprs., Eagle Lake, *Brown & Wieslander* 87; Bartles, McCloud River, *M. S. Baker.* Trinity Mts. to Devils Cañon Mts.: Sisson, *Condit;* Mt. Eddy, *Lemmon;* Whites Creek (head of), Devils Cañon Mts., *Tracy* 14,531.

Refs.—GENTIANA CALYCOSA Griseb., Gen. et Sp. Gent. 292 (1839), type loc. Northwest Coast, *Tolmie;* Hook., Fl. Bor. Am. 2:58, t. 146 (1839); Jepson, Man. 764 (1925). *Pneumonanthe calycosa* Greene, Lflts. 1:71 (1904).

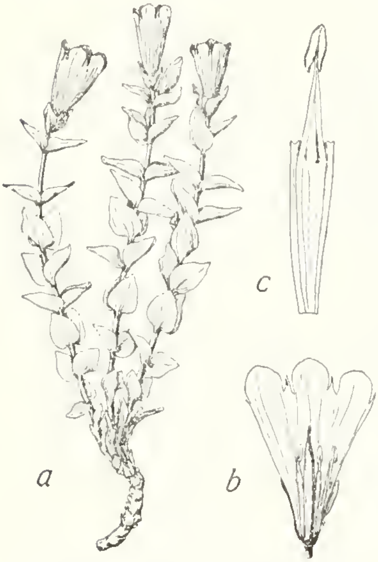

Fig. 337. GENTIANA CALYCOSA Griseb. *a*, habit, × ⅓; *b*, long. sect. of fl., × 1; *c*, stamen with portion of corolla-tube, × 3.

10. G. oregana Engelm. OREGON GENTIAN. (Fig. 338.) Stems erect or ascending, several from a stout taproot, 1 to 2 feet high; leaf-blades ovate or oblong-ovate, ¾ to 1½ inches long; flowers few to several at summit; calyx-lobes oblong to ovate-lanceolate, as long as tube; corolla broadly funnelform, 1¼ to 1⅜ inches long, outside greenish, its lobes blue inside and speckled with white, spreading, roundish-ovate, not narrowed at base; sinus-appendages 2 (or 1), conspicuous, subulate, toothed or entire; capsule more or less stipitate; seeds winged.

Open grassy or sandy lands, 25 to 3000 feet: near the coast from Marin Co. to Del Norte Co., thence easterly to Siskiyou Co. North to British Columbia and Montana. July-Aug.

Locs.—Mt. Tamalpais, *Madalyn Miller;* Pt. Reyes, *Davy;* Pt. Arena, *Bioletti;* Fort Bragg, *W. C. Mathews* 97; Westport, *Jepson* 14,649; Wildcat Ridge, Humboldt Co., *Jepson* 17,941; Loleta, Humboldt Co., *Jepson* 2134; Big Lagoon, Humboldt Co., *Jepson* 9411; Crescent City, *M. S. Baker* 229; West Fork Woolly Creek, w. Siskiyou Co., *Butler;* McCloud River, e. Siskiyou Co., *M. S. Baker.*

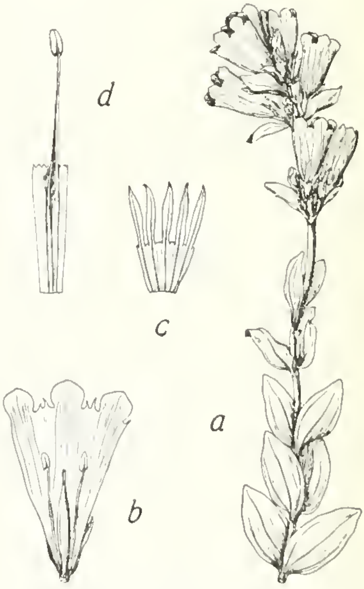

Fig. 338. GENTIANA OREGANA Engelm. *a*, fl. branchlet, × ½; *b*, long. sect. of fl., × 1; *c*, calyx spread open, × 1½; *d*, stamen with portion of corolla-tube, × 1½.

Refs.—GENTIANA OREGANA Engelm.; Gray, Syn. Fl. 2:122 (1878), "Brit. Columbia and w. Idaho (*Lyall, Spalding*) to Oregon (*Nevius,* etc.) and w. California"; Jepson, Fl. W. Mid. Cal. 379 (1901), ed. 2, 320 (1911), Man. 765 (1925). *G. affinis* var. *ovata* Gray, Bot. Cal. 1:483 (1876), type loc. Mt. Tamalpais, *Bolander* 2467. *Pneumonanthe oregana* Greene, Lflts. 1:71 (1904).

11. **G. affinis** Griseb. TRAPPERS GENTIAN. (Fig. 339.) Stems stiffly erect, several from a root-crown, ½ to 1½ feet high; leaf-blades "lanceolate-oblong" to ovate, ¾ to 1¼ inches long; bracts rather narrow; flowers several, congested on short pedicels in the upper axils; calyx-tube with obsolete inner rim, its lobes linear to subulate, very unequal, the 3 longest 2 to 3 lines long (sometimes nearly equaling the tube), the other 2 much shorter, or reduced to mere teeth, or obsolete; corolla purple, its lobes short, rounded but with a short point; sinus-appendages acute, sparingly toothed, or sometimes sparingly laciniate; seeds obliquely elliptic in outline, winged all around.

Moist meadows, 4000 to 7200 feet: Modoc Co. East to New Mexico, Colorado and Minnesota, north to Canada. Aug.

Loc.—Patterson Mill, Warner Mts., *L. S. Smith* 1010. Probably also in eastern Sierra Co., *Lemmon*.

Refs.—GENTIANA AFFINIS Griseb.; Hook., Fl. Bor. Am. 2:56 (1838), "Carlton House to Edmonton House," Saskatchewan River, Canada, *Drummond;* Jepson, Man. 765 (1925). *Pneumonanthe affinis* Greene, Lflts. 1:71 (1904). *Dasystephana affinis* Rydb., Bull. Torr. Club 33: 149 (1906).

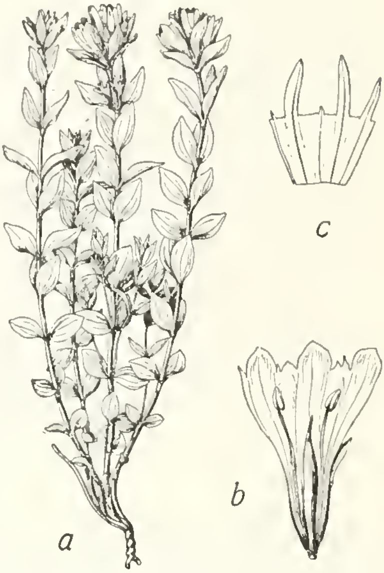

Fig. 339. GENTIANA AFFINIS Griseb. *a*, habit, × ⅓; *b*, long. sect. of fl., × 1½; *c*, calyx spread open, × 1½.

12. **G. sceptrum** Griseb. KINGS GENTIAN. (Fig. 340.) Stems very upright, or ascending from the base, ½ to 2 feet high, several from a cluster of cord-like roots, mostly simple, leafy to the top, bearing 1 to several flowers; leaf blades oblong to ovate-lanceolate, ¾ to 2 inches long; calyx ⅓ to ⅔ as long as the corolla, lobed about to the middle; corolla broadly funnelform, 1½ to 1¾ inches long, its throat and border clear deep blue, commonly greenish-dotted, its lobes short, roundish, 3 to 4 lines broad; sinus membrane truncate and entire or obscurely toothed, not prolonged into appendages; seeds narrow-oblong, wingless.

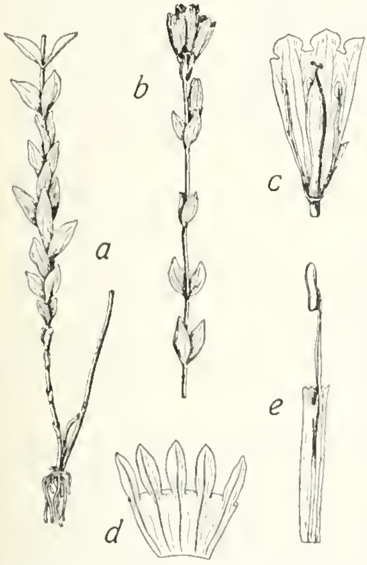

Fig. 340. GENTIANA SCEPTRUM Griseb. *a–b*, habit, × ¼; *c*, long. sect. of fl., × ¾; *d*, calyx spread open, × 1½; *e*, stamen with portion of corolla-tube, × 2.

Boggy spots or sphagnum swamps, 25 to 4000 feet: Sonoma Co. to Del Norte Co. North to British Columbia. July-Sept.

Locs.—Pitkin swamp, Sonoma Co., acc. *M. S. Baker;* Gualala, *Brandt;* Little River, Mendocino Co., *Davy* 6082; Heeser's bog, Noyo, *Jepson* 17,783; Eureka, *M. S. Baker* 8; Big Lagoon, Humboldt Co., *Tracy* 6768; near High Prairie, Bald Mt., *Tracy* 8338; Crescent City, *M. S. Baker* 228.

Refs.—GENTIANA SCEPTRUM Griseb.; Hook., Fl. Bor. Am. 2:57, t. 145 (1838), type loc. Ft. Vancouver, *Douglas;* Jepson, Man. 765 (1925). *G. menziesii* Griseb., Gen. et Sp. Gent. 292 (1839), type from the Northwest Coast, *Menzies*.

5. SWERTIA L. FRASERA

Ours perennial herbs with erect stems from a thick bitter root. Leaves opposite or whorled. Flowers borne in a panicle. Corolla dull white, bluish-tinged or yellowish, commonly with dark dots, rotate, deeply 4 or 5-parted, each lobe bearing 1 or 2 fringed glands. Stamens inserted on the base of the corolla. Style persistent. Capsule coriaceous, more or less flattened, surrounded by the persistent dry corolla.—Species about 20, North America. (Emanuel Sweert, Dutch botanist, 16th century.)

Flowers 5-merous, 1 or 2 in an axil; Tulare and Inyo Cos.......1. *S. perennis.*
Flowers 4-merous.
Stem leaves in opposite pairs; glands single.
Flowers in a narrow spike-like interrupted panicle; glands not lobed.
Gland linear or oblong; leaves white-margined; northern Cal.......2. *S. albicaulis.*
Gland quadrate; leaves not white-margined; S. Cal.......3. *S. neglecta.*
Flowers in a broad or loose panicle; leaves white-margined.
Herbage puberulent; panicle loose, 6 inches long; gland oblong, notched at base; Inyo Co.......4. *S. puberulenta.*
Herbage glabrous; panicle broad, 1 to 2 feet long; gland like an inverted yoke or horse-shoe; cismontane S. Cal.......5. *S. parryi.*
Stem leaves in whorls of 3 to 7.
Panicle broad, branching; glands single, elongated-oblong, forked at summit; leaves with silvery-white margins; e. Mohave Desert.......6. *S. albomarginata.*
Panicle long and narrow (wand-like); corolla-lobes with a crown at base.
Leaves not white-margined; glands 2 to each corolla-lobe; crown at base of corolla-lobes conspicuous, cleft into narrow segments; Sierra Nevada and North Coast Ranges.......7. *S. radiata.*
Leaves white-margined; glands none; crown at base of corolla-lobes tubular, deeply 2-lobed; Kern River basin.......8. *S. tubulosa.*

1. **S. perennis** L. var. **obtusa** Griseb. FELWORT. Plants 5 to 18 inches high; stem single, arising from a short rootstock; herbage glabrous; leaves mostly basal, the blades obovate or elliptic, 1 to 2½ inches long, contracted to a ligulate petiole ½ to 1½ times as long; stem leaves opposite, or partly alternate, remote and mostly smaller; panicle narrow, sometimes reduced to a raceme; flowers solitary or in 2s in the axils of the reduced upper leaves or bracts, on pedicels ¼ to 1 inch long; corolla greenish-white, veined or suffused with bluish-purple, its lobes oblong-ovate, 4 to 5 lines long; glands 2 on the base of each lobe, elliptic, fringed all around; capsule elliptic, flattened, 5 lines long.

High mountain meadows and damp places, 8500 to 10,300 feet: southern Sierra Nevada in Tulare and Inyo Cos. Oregon to Colorado and Alaska. Asia, Europe. July-Aug.

Locs.—Hockett Mdws., *Hall* 8473; Mineral King, *Hall & Babcock* 5645; Volcano Mdws., *Hall & Babcock* 5492; Crabtree Mdws., *Culbertson* 4553; Wildflower Lake, below Kearsarge Pass, *Jepson* 903.

Refs.—SWERTIA PERENNIS L., Sp. Pl. 226 (1753), type European. Var. OBTUSA Griseb., Gen. et Sp. Gent. 331 (1839); Jepson, Man. 766 (1925). *S. obtusa* Ledeb., Mem. Acad. Imp. Sci. St. Petersbourg, 5:526 (1812). *S. covillei* Greene, Lflts. 1:77 (1904), type loc. near Mt. Whitney (Crabtree Mdws., *Culbertson*, and Volcano Mdws., *Coville*).

2. **S. albicaulis** Dougl. MODOC FRASERA. Plants 10 to 18 inches high; stems several from the root-crown, slender; herbage minutely pruinose-puberulent; leaf-blades linear-oblanceolate, 3 to 7 or 9 inches long; stem-leaves opposite; panicle narrow, interrupted, 2 to 6 inches long, formed of dense whorl-like cymes, the cymes sessile or the lower peduncled; corolla pale bluish, purple-dotted inside, 3½ lines long; corolla-lobes ovate-lanceolate, acuminate, each with a single greenish gland; gland linear or oblong, nearly naked above; scales between the filaments setiform-dissected; capsule elliptic, flattened, 4 to 6 lines long.

Dry valleys or ridges, 4000 to 5000 feet: interior plateau region in Siskiyou and Modoc Cos. North to eastern Washington and western Montana. May-Aug.

Locs.—Modoc Co.: Likely, *L. S. Smith*; Badger Spr., Warner Mts., *L. S. Smith* 1165. Siskiyou Co.: Sheep Rock, Mt. Shasta, *Hall & Babcock* 4113.

Var. nitida (Benth.) Jepson comb. n. SHASTA FRASERA. (Fig. 341.) Herbage glabrous; corolla-lobes ovate, shortly and often abruptly acute; scales between the stamen filaments thin, obovate, acuminate, entire or laciniate.—Dry or gravelly soil, on grassy ridges, valley flats or often on brushy slopes, 800 to 5500 feet: North Coast Ranges from Lake Co. to Siskiyou Co.; Sierra Nevada from Nevada Co. to Modoc Co. North to Oregon.

Locs.—North Coast Ranges: Mt. Hanna, Lake Co., *Jepson* 14,644; Cobb Mt., *Tracy* 2244; Crane Creek, w. Tehama Co., *Jepson* 14,645; Hay Fork Valley, Trinity Co., *Tracy* 6466; Hupa, *Chandler* 1383; betw. Twin Valley and Poker Flat, w. Siskiyou Mts., *R. Van Deventer* 272; Redding, *Hoover* 1190; Castle Lake near Sisson, *Congdon;* Yreka, *Butler* 416. Northern Sierra Nevada: Bear River, Nevada Co., *Hall* 10,157; Brush Creek, Butte Co., *W. I. Follett* 65; Butterfly Valley, Plumas Co., *R. M. Austin;* Eagle Lake, Lassen Co., *J. Grinnell;* Whitmore, Shasta Co., *Alma Weigart;* upper Fall River Valley (lava fields e.), ne. Shasta Co., *Jepson* 5772; Forestdale, sw. Modoc Co., *M. S. Baker.*

Refs.—SWERTIA ALBICAULIS Dougl.; Griseb. in Hook., Fl. Bor. Am. 2:67, t. 154 (1838), type loc. betw. Spokane and Kettle Falls, Wash., *Douglas;* Jepson, Man. 766 (1925). *Frasera albicaulis* Griseb., Gen. et Sp. Gent. 330 (1839). *F. nitida* var. *albicaulis* Card, Ann. Mo. Bot. Gard. 18:269 (1931). "Leucocraspedum albicaule Dougl.," a name cited by Jepson acc. to Card, Ann. Mo. Bot. Gard. 18:269, but never used by Jepson at any time. Var. NITIDA Jepson. *Frasera nitida* Benth., Pl. Hartw. 322 (1848), type loc. n. Sierra Nevada (almost certainly in Nevada Co.), *Hartweg* 382; Jepson, Fl. W. Mid. Cal. ed. 2, 320 (1911). *Swertia nitida* Jepson, Man. 766 (1925).

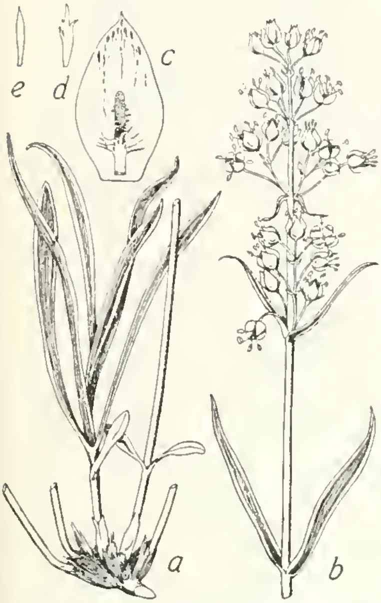

Fig. 341. SWERTIA ALBICAULIS Dougl. var. NITIDA Jepson. *a–b*, habit, × ⅓; *c*, corolla-lobe, × 3; *d–e*, scales, × 2½.

3. **S. neglecta** (Hall) Jepson. PINE FRASERA. (Fig. 342.) Stems several from the root-crown, 1 to 1½ feet high; herbage glabrous; leaves narrowly linear to narrowly oblanceolate, acute, 3 to 5 or 8 inches long; stem-leaves opposite; flowers in dense whorl-like cymes forming an interrupted spike-like panicle, the cymes sessile or the lower peduncled; corolla greenish-white with purple veins, its lobes obovate, abruptly acute, 4 to 5 lines long; gland quadrate, partly covered at base and on the sides by a border with the border fringed all around, produced downward as a sac within the tissue of the petal.

Open pine flats or hillsides, 5900 to 7600 feet: desert slopes of the San Emigdio, San Gabriel and San Bernardino mountains. June-July.

Locs.—Mt. Pinos, *Hall* 6462; Alamo Mt., *Dudley & Lamb* 4646; Rock Creek, n. side San Gabriel Mts., *Peirson* 145 (leaves white-margined); Mt. Gleason, *Elmer* 3609; Swartout Cañon, San Gabriel Mts., *Hall* 1249; upper Holcomb Valley, San Bernardino Mts., *Parish.*

Refs.—SWERTIA NEGLECTA Jepson, Man. 766 (1925). *Frasera neglecta* Hall, Bot. Gaz. 31: 388, pl. 10 (1901), type loc. Swartout Cañon, Mt. San Antonio, *Hall* 1495.

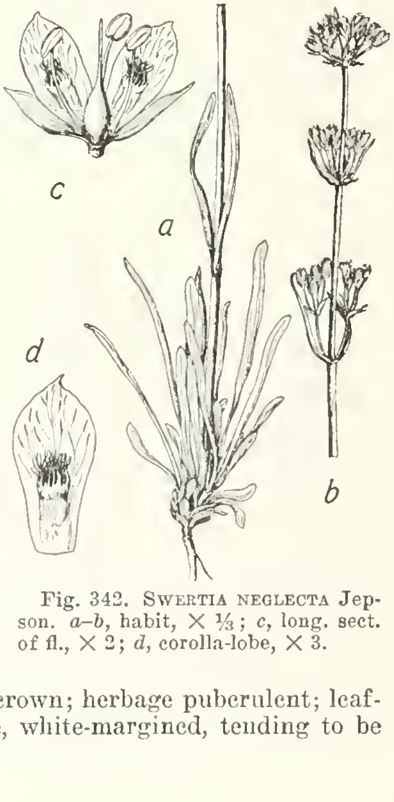

Fig. 342. SWERTIA NEGLECTA Jepson. *a–b*, habit, × ⅓; *c*, long. sect. of fl., × 2; *d*, corolla-lobe, × 3.

4. **S. puberulenta** (Dav.) Jepson comb. n. INYO FRASERA. (Fig. 343.) Plants 10 to 11 inches high; stem stoutish, single from the root-crown; herbage puberulent; leaf-blades narrowly oblong, sessile by a broad base, white-margined, tending to be

conduplicate, 1½ to 2 inches long; stem-leaves opposite; panicle 6 inches long; corolla 4 to 4½ lines long, its lobes obovate, shortly acuminate, above the gland splotched with dark purple dots on a greenish-white ground; gland oblong, its opening at apex fringed, its base notched.

Open pine slopes, 9000 to 11,000 feet: Inyo and Mono Cos. July.

Field note.—Swertia puberulenta is, says F. W. Peirson, a plant of fairly frequent occurrence along the east slope of the southern Sierra Nevada in Inyo and Mono Cos. and has been collected at the following localities: Taboose Pass; Big Pine Creek; Baker Creek, *Duran* 1802; North Fork Bishop Creek; Green Lake; betw. Deadman Creek and June Lake. It has also been found in the White Mts. (Wyman Creek, *Duran* 1736).

Refs.—SWERTIA PUBERULENTA Jepson. *Frasera puberulenta* Dav., Bull. S. Cal. Acad. 11:77, pl. 1 (1912), type loc. South Lake, Bishop Creek, *Davidson* 2705.

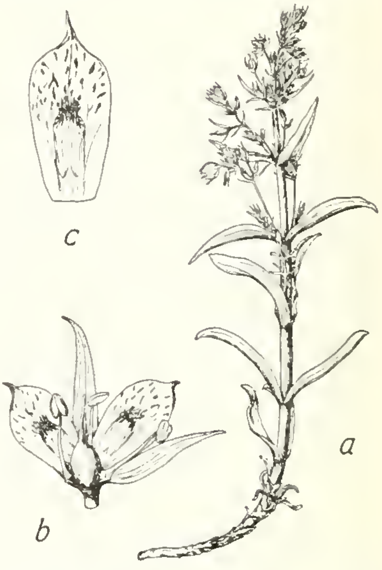

Fig. 343. SWERTIA PUBERULENTA Jepson. *a*, habit, × ¼; *b*, long. sect. of fl., × 2; *c*, corolla-lobe, × 3.

5. **S. parryi** Ktze. COAHUILLA DEER-EAR. (Fig. 344.) Plants 2¼ to 4¼ feet high; stem usually single, stout, arising from the crown of a taproot; herbage glabrous; leaves white-margined, the blades of the basal oblanceolate and drawn down to a narrow base, 4 to 8 inches long, the stem leaves opposite, lanceolate, sessile by a broad base, 2 to 6 inches long; panicle broad, 6 to 12 inches long, its flowers on pedicels ½ to 1 inch long; corolla greenish-white, black-dotted about gland, 6 to 8 lines long, its lobes ovate; glands yoke- or horseshoe-shaped, fringed all around; capsule terete-lanceolate, 7 to 8 lines long.

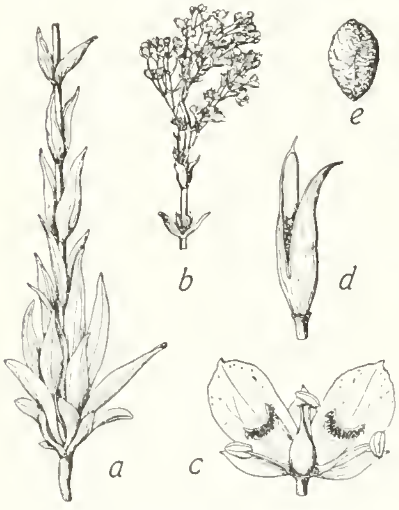

Fig. 344. SWERTIA PARRYI Ktze. *a–b*, habit, × ⅙; *c*, fl. with one side of calyx and corolla removed, × 1⅓; *d*, capsule, × 1½; *e*, seed, × 4½.

Open ground, 1400 to 5000 feet: coastal Southern California from the San Gabriel and San Bernardino mountains to the Cuyamaca Mts. East to Arizona, south to Lower California. Apr.-July.

Locs.—Betw. Live Oak and San Dimas cañons, San Gabriel Mts. (Bull. Torr. Club 49:37); Cajon Cañon, *Jepson* 6101; San Bernardino, *Jepson* 14,646; Saunders Mdw., San Jacinto Mts., *C. V. Meyer* 581; Hemet Valley, *Clary* 1210; betw. Coahuilla Valley and Aguanga, *Jepson* 1476; Witch Creek, *Alderson;* Cuyamaca Mts., *Clara A. Hunt;* Descanso, *M. F. Spencer.*

Refs.—SWERTIA PARRYI Ktze., Rev. Gen. Pl. 2:430 (1891); Jepson, Man. 767 (1925). *Frasera parryi* Torr., Pac. R. Rep. 4:126 (1857), type loc. mts. of San Diego Co., *Parry;* Bot. Mex. Bound. 156 (1859).

6. **S. albomarginata** Ktze. DESERT FRASERA. (Fig. 345.) Plants 8 to 15 inches high; stems single or several from the taproot; herbage glabrous or minutely pubescent; leaf-blades spatulate or oblanceolate, disposed to be conduplicate, 1½ to 3 inches long, ornamented with a bright-silvery margin; stem-leaves in whorls of 3 or 4; panicle rather broad, with the lower branches elongated and thus corymbose; corolla greenish-white, 4 to 5 lines long, its lobes dark-dotted; gland

single, elongated-oblong, fringe-margined all around, the dilated summit obcordate, at base produced downward as a tube into the tissue of the petal.

Gravelly or stony places, 4500 to 7000 feet: eastern Mohave Desert. East to Colorado and Arizona. June-Aug.

Locs.—Providence Mts., *T. Brandegee.* Nev.: Charleston Mts., *Purpus* 6083.

Var. **purpusii** Jepson. Herbage puberulent; gland small, elliptic, not obcordate at summit.—Cañons, western Inyo Co.

Refs.—SWERTIA ALBOMARGINATA Ktze., Rev. Gen. Pl. 2:431 (1891); Jepson, Man. 766 (1925). *Frasera albomarginata* Wats., Bot. King 280 (1871), type loc. St. George, s. Utah, *Palmer. F. induta* Tidestrom, Proc. Biol. Soc. Wash. 36:183 (1923), type loc. Charleston Mts., Nev., *Purpus* 6083. *F. albomarginata* var. *induta* Card, Ann. Mo. Bot. Gard. 18:275 (1931). Var. PURPUSII Jepson, Man. 767 (1925), type loc. Cottonwood Creek Cañon, Inyo Co., *Purpus* 3065.

7. **S. radiata** Ktze. GIANT DEER TONGUE. Plants 2 to 6 feet high; stem very stout, erect, single from the stout taproot; herbage very minutely puberulent; leaf-blades oblong-oblanceolate (or narrowly oblong or obovate), acute, 9 to 13-nerved, 5 to 11 (or 15) inches long, scarcely petioled; stem-leaves in whorls of 3 to 7; panicle narrow, 1 to 2 feet long; flowers on pedicels 1 to 2½ inches long; corolla greenish-white, purple-dotted, 1 to 1¼ inches wide, its lobes ovate, acute, each with fringed or laciniate appendages at base; glands 2 to each lobe, narrowly oblong, long-fringed all around; crown at the base of the lobes cut into setaceous segments which reach to the middle or summit of the glands; capsule 8 to 9 lines long, ovate, flattened contrary to the valves, which are boat-shaped.

Open coniferous woods, 7000 to 9000 (or 10,100) feet: Sierra Nevada from Fresno Co. to Eldorado Co.; North Coast Ranges from Mendocino Co. to Siskiyou Co. North to Washington, east to the Rocky Mts. June-July.

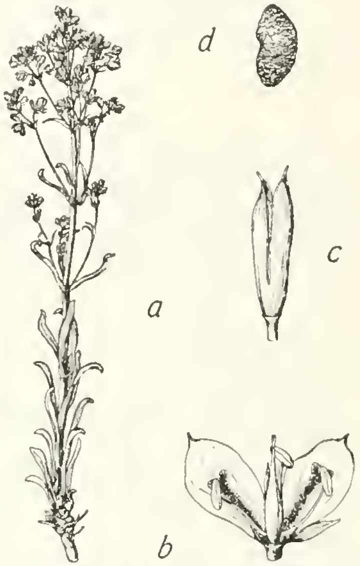

Fig. 345. SWERTIA ALBOMARGINATA Ktze. *a*, habit, × ⅓; *b*, long. sect. of fl., × 2; *c*, capsule, × 2¼; *d*, seed, × 4½.

Field note.—With its tall unbranched main axis rising from a ground rosette of large leaves and often flowering from near the base, this species is a striking feature of the forest where it occurs. While widely distributed, it is seldom met with and the plants are few in a colony and usually solitary. A record of plants found together in numbers has been made by F. W. Peirson who observed in 1935 a scattering colony of twenty or thirty individuals along the stream below Moat Lake in the Virginia Lakes region, Mono Co., at an altitude of 10,100 feet. In open country, with low chaparral or none, here at this spot was an exceptionally fine display, the individuals imposing in appearance.

Locs.—West Vidette, Bubbs Creek, Fresno Co., *Jepson* 815; Bench Mdw., Kaiser Ridge, *Jepson* 13,229; Glacier Pt., Yosemite, *Jepson* 4345; Tuolumne Mdws., *Bolander* 6361; Sonora Pass, *A. L. Grant* 259; betw. Hope Valley and Luther Pass, Alpine Co., *Ottley* 1143; Echo sta., Eldorado Co., comm. *Margaret A. Kelley.* North Coast Ranges: Mt. Sanhedrin (Ann. Mo. Bot. Gard. 18:262); Grouse Mt., Humboldt Co., *Tracy* 4851; Trinity Summit, *Jepson;* Salmon Summit, *Jepson* 2075; Shackelford Creek, w. Siskiyou Co., *Butler* 417.

Refs.—SWERTIA RADIATA Ktze., Rev. Gen. Pl. 2:430 (1891); Jepson, Man. 767 (1925). *Tessaranthium radiatum* Kell., Proc. Cal. Acad. 2:144, fig. 41 (1862), type loc. summit of Sierra Nevada at headwaters of Carson River, *C. D. Gibbs. Frasera speciosa* Dougl.; Hook. Fl. Bor. Am. 2:66, t. 153 (1838), type loc. upper Columbia River region, *Douglas;* Jepson, Fl. W. Mid. Cal. ed. 2, 320 (1911); not Swertia speciosa Wall. (1828).

8. **S. tubulosa** (Cov.) Jepson. KERN FRASERA. Plants ½ to 2¼ feet high; stem stout, erect, glaucous, arising from a deep-seated taproot, usually single; herbage glabrous; leaves mainly basal, 1½ to 3 inches long, the blades spatulate, white-

margined, tending to be conduplicate, narrowed to a petiole-like base; stem-leaves in whorls of 5 or 6; panicle virgate or spike-like, very dense, or interrupted below, often much longer than the stem proper; corolla pale white with bluish veins, 4 to 6 lines long, its lobes oblong-obovate, acuminate; gland none; crown a deeply 2-lobed tube with lobes fringed or laciniate, the anterior lobe the shorter; capsule elliptic, flattened, 4 lines long.

Open coniferous woods, 6000 to 9300 feet: southern Sierra Nevada in the Kern River basin from Farewell Gap to Olancha Peak. June-Aug.

Locs.—Broder's Cabin, near Farewell Gap, *Purpus;* Trout Mdws., Little Kern River, *Jepson* 4917; Olancha Peak, *S. W. Austin.*

Refs.—SWERTIA TUBULOSA Jepson, Man. 767 (1925). *Frasera tubulosa* Cov., Proc. Biol. Soc. Wash. 7:71 (1892), type loc. Soda Sprs., South Fork Kern River, *Coville* 1598; Contrib. U. S. Nat. Herb. 4:151, pl. 13 (1893).

6. **MENYANTHES** Tourn.

Perennial herbs with creeping rootstocks. Leaves all basal and the inflorescence raised on a naked scape. Calyx 5-parted. Corolla white or pink, short-funnelform, 5-cleft, the lobes spreading, copiously white-bearded on the inside. Stamens 5. Capsule inclined to burst irregularly.—Species 2, North America, Europe and Asia. (Greek men, month, and anthos, flower, blooming about that long.)

1. **M. trifoliata** L. BUCKBEAN. Plants 8 to 15 inches high; leaves long-petioled, 3-foliolate; leaflets oval or obovate, 1 to 3½ inches long; flowers in a raceme; corolla white, 5 to 6 lines long.

Bogs and shallow lake shores, 3000 to 10,000 feet: Sierra Nevada from Fresno Co. to Siskiyou Co.; San Francisco. North to Alaska and all northern regions around the earth. May-July.

Locs.—Black Mt., Fresno Co., *Hall & Chandler* 732; Echo Ridge, Lake Tahoe, *Ottley* 1174; Castle Peak (Mt. Stanford) trail, Nevada Co., *Sonne;* Big Mdws., Plumas Co., *R. M. Austin;* East Fork King Creek toward Twin Lakes, se. Shasta Co., *Jepson* 4111; Goose Valley, Shasta Co., *M. S. Baker;* Sisson, Siskiyou Co., *Jepson* 14,643. San Francisco (Zoe 2:4). Alas.: Glacier Valley, Unalaska, *Jepson* 260.

Refs.—*Menyanthes trifoliata* L., Sp. Pl. 145 (1753), type from Europe; Jepson, Fl. W. Mid. Cal. ed. 2, 320 (1911), Man. 768 (1925).

LOGANIACEAE. LOGANIA FAMILY

Shrubs or trees, rarely herbs. Leaves simple, opposite or whorled, the stipules combined and interpetiolar, or reduced to an interpetiolar line, or occasionally distinct. Flowers perfect, regular, borne in cymes or rarely racemes. Calyx 4 (5)-lobed. Corolla usually 4-lobed, the stamens as many as and alternate with the lobes of the corolla and inserted on its tube or throat. Ovary superior, 2-celled, many-ovuled; style 1; stigma entire or 2-lobed. Fruit a capsule or a berry.—Genera 30, species about 400, mainly tropical, all continents save Europe.

1. **BUDDLEIA** L.

Ours shrubs. Herbage with a dense or woolly indument. Flowers commonly small, 4-merous, rarely 5-merous, borne in dense heads, rarely in panicles. Calyx campanulate. Corolla open-campanulate or sometimes salverform, its lobes imbricated in the bud. Stamens with the anthers sessile or nearly so in the corolla-throat. Fruit a septicidal capsule.—Species 70, North and South America, Africa, Asia. (Adam Buddle, died 1715, an English botanist who corresponded with John Ray.)

1. **B. utahensis** Cov. Densely branched shrub ¾ to 1½ feet high; leaf-blades oblong to linear, 6 to 9 lines long, entire to irregularly and sparsely crenate, shortly

petioled (1/3 line) or subsessile, 6 to 9 lines long, with smaller leaves fascicled in the axils; cymes forming dense head-like whorls in the axils of the opposite leaves, and thus interruptedly spicate at the ends of the branches; calyces densely tomentose; corolla-tube narrow-campanulate, 2 to 2½ lines long, its limb salverform, 1 to 1½ lines wide.

Montane slopes, 3000 to 6000 feet: Kingston Range, northeastern Mohave Desert. East to southern Utah. May.

Locs.—Kingston (5 mi. sw.), acc. C. B. Wolf (Rep. Rancho Santa Ana Bot. Gard., Oct. 1935-Apr. 1936, 15). Nev.: Indian Spr., Charleston Mts., *Jones;* Jean, Clark Co., *K. Brandegee.*

Refs.—BUDDLEIA UTAHENSIS Cov., Proc. Biol. Soc. Wash. 7:69 (1892), type loc. St. George, s. Utah, *Palmer;* Contrib. U. S. Nat. Herb. 4:149, pl. 12 (1893).

APOCYNACEAE. DOGBANE FAMILY

Ours perennial herbs with milky juice. Leaves simple, entire and opposite. Flowers complete, regular, 5-merous except the pistils which are 2. Calyx free or nearly free from the ovaries, imbricated in the bud and persistent. Corolla-lobes convolute in the bud. Stamens borne on the corolla alternate with its lobes; anthers produced at base into a sterile appendage, connivent around the stigma. Ovaries 2 and distinct (though their styles and stigmas are united into one), developing into follicles. Embryo large, straight, in scanty albumen.—A family closely allied to the milkweeds. Amsonia has alternate leaves.—Genera 130, species about 1000, all continents but mostly tropical.

Bibliog.—Brown, R., Apocineae (Mem. Wern. Nat. Hist. Soc. 1:59–78,—1811). Greene, E. L., New Species of Apocynum (Pitt. 5:64–66,—1902); Accessions to Apocynum (Lflts. 2: 164–189,—1911–1912). Beguinot, A., & Beloserksy, N., Revisione monografica del genre Apocynum L. (Atti Accad. Lincei, Mem. Cl. Fis. ser. 5, 9:595–734, tt. 1–12,—1913); "more of a curiosity than a scientific work" (R. E. Woodson). Woodson, R. E., Jr., Monograph of the genus Amsonia (Ann. Mo. Bot. Gard. 15:379–435, pls. 51–53,—1928); Studies in the Apocynaceae (l.c. 17:1–212, figs. 1–9, pls. 1–18,—1930; 23:169–438, pls. 1–7,—1936); The identity and nomenclature of Apocynum androsaemifolium L. (Rhod. 34:30–31,—1932). Macfarlane, J. M., The evolution and distribution of * * * Apocynaceae and Asclepiadaceae 1–181, with phyl. tables. 1933. Woodson, R. E., Jr., & Moore, J. A., The vascular anatomy and comparative morphology of apocynaceous flowers (Bull. Torr. Club 65:135–166, pls. 3–5,—1938).

Stamens borne on the summit of the corolla-tube; anthers free from the stigma; buds sinistrorsely convolute; seeds not comose.
  Leaves alternate; flowers without glands........1. AMSONIA.
  Leaves opposite; flowers with 2 glands alternate with the carpels........2. VINCA.
Stamens borne on the base of the corolla-tube; anther-cells produced at base into sterile appendages connivent around the stigma and adnate to it by a point at the base of the fertile portion; follicles not torulose; seeds comose.
  Style very short, not appendaged; corolla-tube with 5 small appendages alternate with the stamens; buds dextrorsely convolute........3. APOCYNUM.
  Style filiform, bearing a conspicuous annular membrane; corolla-tube with a minute appendage behind each stamen; buds not convolute........4. CYCLADENIA.

1. AMSONIA Walt.

Leaves numerous. Flowers in a terminal compound cyme. Corolla-lobes rotate, its tube in ours dilated upwards, constricted at the mouth, within (below the stamens) beset with reflexed hairs. Anthers free from the stigma. Stigmas subtended by a globose thickening (in ours). Follicles slender, torulose.—Species 5 in North America, 1 in Japan. (Charles Amson of South Carolina.)

Herbage tomentose; sinuses of calyx rounded; stigma purplish........1. *A. tomentosa.*
Herbage glabrous; sinuses of calyx acute; stigma whitish........2. *A. brevifolia.*

1. **A. tomentosa** Torr. & Frem. (Fig. 346.) Stems many from the crown of a stout taproot, 8 to 15 inches high; herbage cinereous-tomentose; leaf-blades ovate to lanceolate, acuminate, nearly sessile, 1 to 2 inches long; calyx-lobes apparently

narrowly membranous-margined; corolla whitish, often indigo in age, its lobes half as long as the tube; follicles inclined to break into one-seeded joints.

Desert plains and cañons, 2300 to 4000 feet: north side of the Colorado Desert; eastern Mohave Desert. East to Utah. Apr.-May.

Locs.—North side of Colorado Desert: Monsen Cañon, Eagle Mts., *Weeks;* Cottonwood Pass, Cottonwood Mts., *Hall* 6007; betw. Quail Spr. and Lost Horse Cañon, *Clary* 1173. Eastern Mohave Desert: Cactus Flat, n. slope San Bernardino Mts., *Parish* 3769; Mitchells Caverns, Providence Mts., *Mary Beal* 476; Leastalk, *Parish.*

Refs.—AMSONIA TOMENTOSA Torr. & Frem.; Frem., Rep. Sec. Exped. 316 (1845), "probably west of the Rocky Mts.," *Fremont. A. brevifolia* var. *tomentosa* Jepson, Man. 768 (1925).

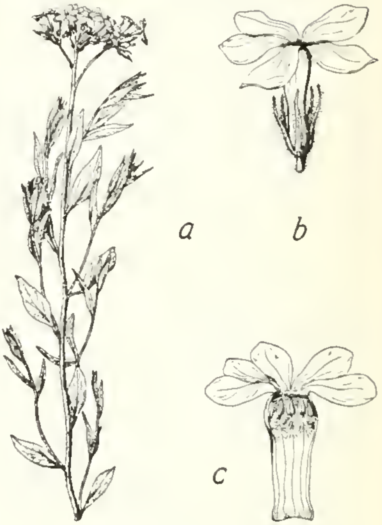

Fig. 346. AMSONIA TOMENTOSA Torr. & Frem. *a*, habit, × 1/3; *b*, fl., × 2½; *c*, cor. spread open, × 2½.

2. **A. brevifolia** Gray. (Fig. 347.) Similar to A. tomentosa; stems 6 to 10 inches high; herbage glabrous; calyx-lobes membranous-margined; corolla whitish with a tinge of lavender, drying bluish; ovary obtusish.

Dry flats and cañon sides, 3000 to 5000 feet: north side of Colorado Desert; southern Mohave Desert; Inyo Co. East to Utah. Mar.-Apr.

Tax. note.—Amsonia brevifolia is remarkably similar to A. tomentosa in habit, leaves, inflorescence and flowers. The range of these two species is the same and probably they are never found separately. There is a striking lack of intergradation as to pubescence, but other differences are doubtful. Woodson in his Monograph of Amsonia assigns pointed seeds to A. tomentosa and truncate seeds to A. brevifolia, but Purpus' collections of these two species at Ash Meadows, Nevada, show no significant difference as to seeds, while A. tomentosa, as collected by Parish at Leastalk, New York Mts., reveals quite truncated seeds.

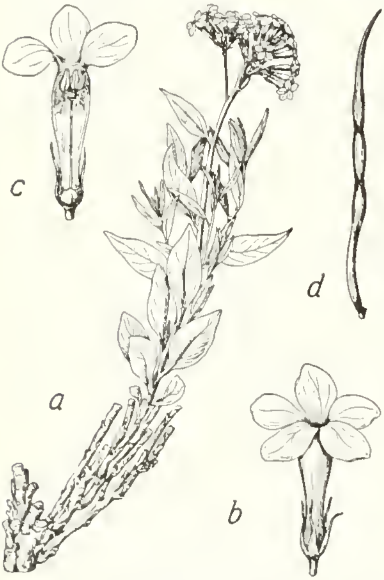

Fig. 347. AMSONIA BREVIFOLIA Gray. *a*, habit, × 1/3; *b*, fl., × 1⅔; *c*, long. sect. of fl., × 1⅔; *d*, follicle, × ⅔.

Locs.—Monsen Cañon, Eagle Mts., *Weeks;* Lookout Mt. n. of Indio, *Jepson* 5980; White Tank, Piute Mts., Riverside Co., *Jepson* 12,626; Rabbit Sprs., s. Mohave Desert, acc. *Parish;* Cactus Flat, n. slope San Bernardino Mts., acc. *Peirson;* Mitchells Caverns, Providence Mts., *Mary Beal* 477; Willow Cañon, Panamint Mts. (Contrib. U. S. Nat. Herb. 4:148).

Refs.—AMSONIA BREVIFOLIA Gray, Proc. Am. Acad. 12:64 (1876), based on spns. from s. Utah, *Thompson,* w. Ariz., *Parry,* and se. Cal., *Palmer;* Jepson, Man. 768 (1925).

2. **VINCA** L.

Flowers solitary and axillary. Corolla salverform, with a callous constriction at the throat, its lobes broad. Stigma annular, bordered below by a reflexed membranous wing or cup, and above by a truncate upper portion. Follicles narrow, terete.—Species 5, Europe, Asia, north Africa. (Ancient Latin name.)

1. **V. major** L. PERIWINKLE. Sterile stems trailing, the flowering ones erect; corolla blue, 1 to 1¼ inches broad.

Native of Europe, escaped from gardens into protected areas along watercourses, 5 to 800 feet: Mendocino coast; cañons about San Francisco Bay; San Luis Obispo Co.; coastal Southern California. June-Sept.

Locs.—Westport, w. Mendocino Co., *Jepson;* Berkeley; Oakland Hills near Mills College; San Luis Obispo, *L. C. Watson.*

Refs.—VINCA MAJOR L., Sp. Pl. 209 (1753), type European; Jepson, Man. 768 (1925).

3. **APOCYNUM** L.

Flowers small, in terminal cymes. Calyx small, deeply 5-cleft, its tube by means of a disk adnate to the back of the ovaries below. Corolla campanulate, 5-lobed, bearing 5 small triangular-subulate appendages alternate with the stamens. Stamens borne at base of corolla; filaments short and broad; anthers sagittate, acute. Style very short or hardly any; stigma ovoid, obscurely 2-lobed. Follicles slender, pointed, terete. Seeds numerous, flattish.—Species 5 to 18, North America, Europe, Asia. (Greek apo, from, and kuon, dog, ancient name of the Dogbane.)

Low herb; leaves greenish above; corolla rose-purple to white, its lobes spreading.
  Leaf-blades ovate or oblong-ovate, mostly 2 to 2¾ inches long; corolla campanulate; follicles pendulous........1. *A. androsaemifolium.*
  Leaf-blades orbicular to oblong-ovate or ovate, mostly ¾ to 1½ inches long; corolla short, but nearly cylindric; follicles erect........2. *A. pumilum.*
Tall herb; leaves yellowish; corolla greenish-white, its lobes erect........3. *A. cannabinum.*

1. **A. androsaemifolium** L. BITTER DOGBANE. Stem diffusely branched, 8 to 15 inches high; herbage glabrous to finely pubescent; leaf-blades ovate to oblong-ovate, nearly always very acute, usually mucronate, dark green above, pale beneath, (¾ or) 2 to 2¾ inches long, on short petioles; flowers in short cymose clusters at the ends of the branches, or a few solitary in the upper axils; calyx-lobes much shorter than the corolla-tube; corolla campanulate, red-purple or pink to nearly white, 2 to 4 lines long, its lobes broadly oblong; follicles pendulous, 3½ to 5½ inches long.

Mountain slopes, 5000 to 8400 feet: San Jacinto and San Bernardino mountains. East to Georgia and Nova Scotia, north to Canada. July-Aug.

Locs.—San Jacinto Mts.: Tamarack Valley, *Hall* 2595. San Bernardino Mts.: near Mt. San Gorgonio, *Blasdale;* Mt. San Bernardino, *R. J. Smith;* Glen Martin, *R. J. Smith;* Sugar Loaf, *Peirson* 9034; Waterman Cañon (head of), *Hall* 1290. No California specimens before us are in fruit, but plants beyond our borders bear pendulous pods.

Refs.—APOCYNUM ANDROSAEMIFOLIUM L., Sp. Pl. ed. 2, 311 (1762), "Virginia, Canada"; Curtis, Bot. Mag. t. 280 (1794).

2. **A. pumilum** Greene. MOUNTAIN HEMP. (Fig. 348.) Plants smaller than in A. androsaemifolium, 5 to 8 (or 14) inches high; herbage glabrous to puberulent; leaf-blades ovate to elliptic or orbicular, frequently obtuse at apex, varying from obtuse to cordate at base, usually rounder than in no. 1, ¾ to 1½ (or 2¾) inches long, short-petioled to subsessile; corolla pinkish or whitish, short and often broad but nearly cylindric, 2 to 3½ lines long; follicles erect, 2¾ to 4½ inches long.

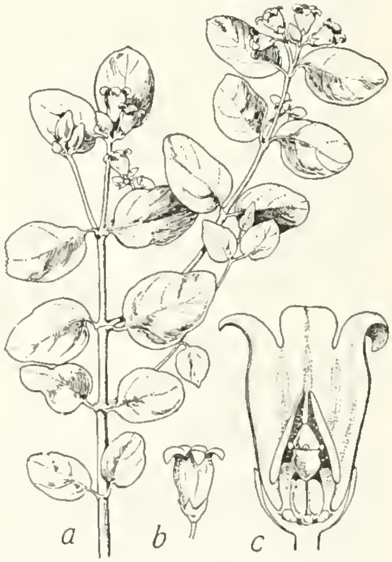

Fig. 348. APOCYNUM PUMILUM Greene. *a,* fl. branchlet, × ½; *b,* fl., × 1½; *c,* long. sect. of fl., × 4½.

Loamy slopes or rocky rifts: Southern California mountains, 5000 to 9000 feet; North Coast Ranges from Napa Co. to Siskiyou Co., 300 to 5500 feet; Sierra Nevada from Tulare Co. to Modoc Co., 3000 to 9000 feet. East to Nevada, north to Idaho and British Columbia. June-July.

Note on variation.—In the higher Sierra Nevada the herbage is commonly glabrous. At lower altitudes in the Coast Ranges or Sierra Nevada the plants may be (a) glabrous (Whitmore, Shasta Co., *Alma Weigart*); or (b) the stems and petioles may be puberulent, the leaves glabrous or essentially so (Hamilton sta., Mariposa Co., *A. L. Grant* 831); or (c) the plants may be puberulent (St. Helena, *Jepson* 14,622); or (d) the plants may be puberulent save the upper side of the leaves or the upper side be provided with extremely scattered microscopic hairs (betw. Dyers ranch and Hawkins Bar, New River, *Jepson* 1987). Pubescence or various degrees of it or the lack of it is not associated with any other characters. Between Marble Fork Kaweah River and Round Mdw. we observed two plants growing side by side which were in every apparent way identical save that one was glabrous and the other puberulent (*Jepson* 696).

On the erect stems of Apocynum cannabinum the leaves stand in rather closely erect pairs, whereas on the diffuse branches of Apocynum pumilum the spreading leaves display their upper surface to the sky. High temperatures may bring a marked change in this position in the case of A. pumilum. On exposed ridges or dry slopes the leaves borne on spreading stems may take up a hanging or pendulous position during the high insolation period of midsummer days. The assumption of such a protective position was observed to great advantage on the Devil's Backbone near Trinity Summit in July, 1902. The opposite leaves turn directly downward, back to back, and thus lessen transpiration, as was also noted on the Marble Fork Kaweah River in June, 1900.

Locs.—S. Cal. mts.: Palomar Mt., *Jepson* 14,626; Tahquitz, San Jacinto Mts., *Hall;* Fredalba, San Bernardino Mts., *Abrams* 2775; Vincent Gulch, San Gabriel Mts., *Peirson* 882. North Coast Ranges: Howell Mt., Napa Range, *Jepson* 14,624; Lyons Valley, Mayacamas Range, *Jepson* 2252; Asa Bean Flat, Middle Eel River, se. Trinity Co., *Jepson* 14,620; Devil's Backbone, near Salmon Summit, *Jepson* 2097; Cold Spr., Woolly Creek, w. Siskiyou Co., *Butler* 77; Sisson, *Jepson* 14,625; Yreka, *Butler* 75. Sierra Nevada: Wolverton Creek, Tulare Co., *W. Fry* 369; Bubbs Creek, Kings Cañon, *Jepson* 808; Huntington Lake, *Jepson* 12,984; Hazel Green to Big Mdws., Mariposa Co., *Jepson* 14,623; Kennedy Mdws., Tuolumne Co., *A. L. Grant* 171; Bear Valley, Nevada Co., *Jepson* 14,621; Pioneer sta., North Fork Yuba River, *Jepson* 16,785; Martin Sprs., Eagle Lake, *Brown & Wieslander* 3; Butte Lake, Lassen Co., *J. Grinnell;* Mt. Bidwell, Modoc Co., *Manning.*

Refs.—APOCYNUM PUMILUM Greene, Man. Reg. S. F. Bay 240 (1894); Woodson, Ann. Mo. Bot. Gard. 17:101 (1930). *A. androsaemifolium* var. *pumilum* Gray, Syn. Fl. 2:83 (1878), "California to British Columbia"; Jepson, Fl. W. Mid. Cal. 380 (1901), ed. 2, 321 (1911), Man. 769, fig. 755 (1925). *A. rhomboideum* Greene, Pitt. 5:66 (1902), type loc. Napa Valley floor e. of St. Helena, *Jepson* 14,625. *A. viarum* Hel., Muhl. 2:110 (1906), type loc. Nevada City, *Heller* 8110. *A. androsaemifolium* var. *incanum* DC., Prod. 8:439 (1844); Woodson, Ann. Mo. Bot. Gard. 17:91 (1930). *A. stenolobum* Greene, Lflts. 2:183 (1912), type loc. Davis Creek, Modoc Co., *R. M. Austin*. *A paniculatum* Greene, Lflts. 2:183 (1912), type loc. Warner Creek, Modoc Co., *R. M. Austin*. *A pulchellum* Greene, Lflts. 2:186 (1912), type loc. "mountain meadows of Lassen Co.," *R. M. Austin*. *A. rotundifolium* Greene, Lflts. 2:186 (1912), type loc. Placer Co., *Carpenter*. *A. arcuatum* Greene, Lflts. 2:187 (1912), type loc. Gravelly Valley, South Fork Eel River, n. Lake Co., *Jepson*. *A. cercidium* Greene, Lflts. 2:188 (1912), type loc. Fort Bidwell, Modoc Co., *Manning*. *A. austinae* Greene, Lflts. 2:188 (1912), type loc. Lassen Creek, Modoc Co., *R. M. Austin*. *A. luridum* Greene, Lflts. 2:189 (1912), type loc. Lassen Creek, Modoc Co., *R. M. Austin*. *A diversifolium* Greene, Lflts. 2:189 (1912), type loc. Fredalba, San Bernardino Mts., *Abrams*. *A. androsaemifolium* var. *nevadense* Jepson, Man. 769 (1925), type loc. Huntington Lake, *A. L. Grant* 1124.

3. **A. cannabinum** L. INDIAN HEMP. Stems erect, rather strict, simple below, 2 to 4 feet high; herbage of a light almost yellowish green, glabrous or sometimes more or less puberulent; leaf-blades oblong or oval to oblong-ovate or lanceolate, abruptly acuminate, obtuse at base or the lower often subcordate, 2½ to 4¼ inches long, sessile or short-petioled; calyx-lobes a little exceeding the corolla-tube; corolla greenish, 1½ to 1¾ lines long; follicles pendulous, 3 to 3½ inches long.

Stream- and river-banks and moist flats, —250 to 7500 feet: widely distributed in California, more common toward the interior. East to Florida and Nova Scotia, north to British Columbia. May-July.

Field note.—The herbage of Apocynum cannabinum is poisonous to cattle. The native tribes used the mature stems for making rope and cord; from their fibres they manufactured a superior product. Apocynum pumilum Greene was also used as a source of fibre.

Locs.—S. Cal.: Palomar Mt., San Diego Co., *Esther Hewlett* 35; San Bernardino Valley, *Parish* 11,427; Devils Punch Bowl, San Gabriel Mts., *Peirson* 146; Lockwood-Piru forks, Mt. Pinos, *Dudley & Lamb* 4657; Piute Creek, e. Mohave Desert, *Wilson*. Coast Ranges: upper San Benito River at Lorenzo Creek, *Jepson* 12,225; Nacimiento River, *Jepson;* Los Gatos (foothills w.), *Heller* 7518; Aetna Sprs., Napa Co., *Zeile;* Scott Valley, Lake Co., *Jepson* 14,617; Dyerville, main Eel River, *Constance* 848; Kneeland Prairie, Humboldt Co., *Tracy* 3838; Trinity River Valley at Willow Creek, *Tracy* 10,148. Great Valley: Greenfield near Bakersfield, *Davy* 1852; Stockton, *Sanford;* Hass Slough, e. Solano Co., *Jepson* 20,925. Sierra Nevada: Onyx, Kern Co., *Voegelin* 23; betw. Big Mdws. and Yosemite, *Jepson* 14,618; Hetch-Hetchy, *Jepson;* South Fork Tuolumne bridge, *A. L. Grant* 840; Clinton Bar, Amador Co., *Hansen* 1162; Little Chico, *C. C. Bruce;* Fall River Lake, Shasta Co., *M. S. Baker*. East of the Sierra Nevada: Eagle, Death Valley, *Jepson* 6941; Bishop Creek, Inyo Co., *Shockley* 428; Middle Lake, Modoc Co., *Austin & Bruce* 2336.

Var. **floribundum** (Greene) Jepson comb. n. Herbage glabrous; leaf-blades ovate, mostly acute, mucronate, 1¼ to 3 inches long; corolla cylindric, its tube longer than the width of the limb; otherwise similar to the species.—Montane valleys and slopes, 4000 to 7500 feet: Middle Fork Lockwood Creek, Mt. Pinos, *Hall* 6649; Nine-mile Creek, Tulare Co., *Zeile;* Yosemite, *Alice King*. East to Nevada.

Refs.—APOCYNUM CANNABINUM L., Sp. Pl. 1:213 (1753), "Virginia, Canada"; Jepson, Fl. W. Mid. Cal. 381 (1901), ed. 2, 321 (1911), Man. 769 (1925). *A. pubescens* Mitchell; R. Br., Mem. Wern. Soc. 1:68 (1809), type loc. Virginia. *A. cannabinum* var. *pubescens* DC., Prodr. 8:440 (1844); Woodson, Ann. Mo. Bot. Gard. 17:122 (1930). *A. cannabinum* var. *glaberrimum* DC., l.c. 439, type loc. Canada. *A. salignum* Greene, Pitt. 5:64 (1902), type loc. Humboldt Co., *Chesnut & Drew*. *A. hypericifolium* Ait. var. *salignum* Bég. & Bel., Monog. Apocynum 118, pl. 7 (1913). *A. oblongum* Greene, Pitt. 5:65 (1902), type loc. Clinton Bar, Mokelumne River, *Hansen* 1162. *A. vestitum* Greene, Man. Reg. S. F. Bay 240 (1894), type loc. "hills w. of Napa Valley," *Greene*. *A. medium* var. *vestitum* Woodson, l.c. 116. *A. suksdorfii* Greene, Pitt. 5:65 (1902), type loc. Columbia River, *Suksdorf;* Woodson, l.c. 117. *A. palustre* Greene, Lflts. 1:58 (1904), type loc. Suisun, *C. F. Baker* 3247. *A. bicolor* McGregor, Bull. Torr. Club 37:261 (1910), type loc. Glen Alpine, Lake Tahoe, *McGregor* 32. *A. bolanderi* Greene, Lflts. 2:175 (1912), type loc. Wawona (Clark's sta.), South Fork Merced, *Bolander*. *A. breweri* Greene, Lflts. 2:176 (1912), type loc. Yosemite Valley, *Brewer* 1673. *A. densiflorum* Greene, Lflts. 2:176 (1912), type loc. Tehachapi, *Greene*. *A. thermale* Greene, Lflts. 2:177 (1912), type loc. Tassajara Hot Sprs., Santa Lucia Mts., *Elmer*. *A. longifolium* Greene, Lflts. 2:177 (1912), type loc. Sespe Creek, near Ten Sycamore Flat, Ventura Co., *Abrams & McGregor*. Var. FLORIBUNDUM Jepson. *A. floribundum* Greene, Erythea 1:151 (1893), type loc. mts. "west of Mohave Desert in Kern Co." (undoubtedly Tehachapi), *Greene*. *A. medium* var. *floribundum* Woodson, Ann. Mo. Bot. Gard. 17:113 (1930).

4. **CYCLADENIA** Benth.

Stems simple, one to many from a large fleshy root, bearing 2 to 5 pairs of leaves and 2 or 3 axillary peduncles with 2 or 3 rose-purple flowers on slender pedicels. Calyx parted into 5 slender lobes. Corolla funnelform with 5 broadly oblong or roundish lobes and 5 minute appendages alternate with the lobes, one behind each stamen. Stamens borne on the tube towards the base. Style filiform, with a conspicuous membranous reflexed collar under the stigma. Disk an entire cup surrounding the base of the ovaries.—Species 1. (Greek kuklos, a ring, and aden, a gland, referring to the disk.)

1. **C. humilis** Benth. Stems ascending or diffuse, 3 to 6 inches high; herbage glabrous; leaf-blades thickish, ovate or roundish, obtuse to cordate at base, 1¼ to 2¾ inches long, on petioles ¼ to 2 inches long; corolla 7 to 10 lines long, its lobes with crinkly edges, its tube bearing a narrow band of reflexed hairs at the insertion of the stamens, the filaments also clothed with similar hairs; pedicels 7 to 10 lines long; follicles 1¼ to 2 inches long.

Rocky mountain slopes or gravelly ridges, 3500 to 8500 feet: North Coast Ranges from Lake Co. to western Siskiyou Co.; Sierra Nevada from Lassen Co. to eastern Siskiyou Co. June-July.

Locs.—North Coast Ranges: Cobb Mt., Lake Co., *C. F. Leithold;* Snow Mt., *Purpus* 851; Devil's Backbone, near Salmon Summit, *Jepson* 2072; Bally Mt., Shasta Co., *Brewer* 1448; Sisson, *M. S. Baker*. Sierra Nevada: Silver Lake, Lassen Co., *M. S. Baker;* Brokeoff Mt., Tehama Co., *J. Grinnell;* Hot Springs Valley (ridge n.), Lassen Peak, *Jepson* 12,295; Medicine Lake, e. Siskiyou Co., *M. S. Baker*.

Var. **tomentosa** Gray. Herbage densely tomentose-pubescent; calyx hirsute.—Plumas Co. to Siskiyou Co.: Dutch Hill, Plumas Co., *R. M. Austin;* Butte Co., *R. M. Austin;* Viola, Tehama Co., *J. Grinnell;* Sisson, *K. Brandegee.*

Var. **venusta** Woodson. (Fig. 349.) Calyx and corolla soft-pubescent; corollas paler than the average of the species.—Eastern San Gabriel Mts. (Mt. San Antonio, *Peirson* 147; Mt. Disappointment, *Ewan* 7237); Santa Lucia Mts. (Santa Lucia Peak, *Jepson* 4746).

Refs.—CYCLADENIA HUMILIS Benth., Pl. Hartw. 323 (1849), type loc. n. Sierra Nevada, *Hartweg* 309; Jepson, Fl. W. Mid. Cal. 381 (1901), ed. 2, 322 (1911), Man. 769 (1925). Var. TOMENTOSA Gray, Syn. Fl. ed. 2, 2:400 (1886); Jepson, Man. 769 (1925). *C. tomentosa* Gray, Bot. Cal. 1:474 (1876), type loc. betw. Big Mdws. and Indian Valley, Plumas Co., *Lemmon.* Var. VENUSTA Woodson; Munz, Man. S. Cal. Bot. 379 (1935). *C. venusta* Eastw., Bull. Torr. Club 29:77 (1902), type loc. Santa Lucia Peak, *Eastwood.*

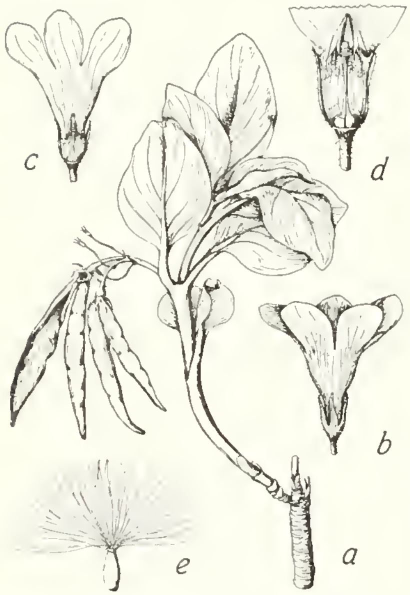

Fig. 349. CYCLADENIA HUMILIS Benth. var. VENUSTA Woodson. *a*, habit, × 1/3; *b*, fl., × 3/4; *c*, long. sect. of fl., × 3/4; *d*, long. sect. of fl., × 2; *e*, seed, × 2/3.

ASCLEPIADACEAE. MILKWEED FAMILY

Perennial herbs with milky juice. Leaves opposite or whorled. Flowers regular. Calyx 5-parted. Corolla 5-lobed. Pistils 2, with distinct superior ovaries; styles distinct below but united above into a short-cylindric stylar disk. Stamens 5, inserted on the base of the corolla and united into a tube which is blended above with the stylar column, the united filaments (filament-column) and united anthers (anther-column) being here called the stamen-column and commonly bearing hoods (or appendages). Anthers tipped with a scarious membrane inflexed on the summit of the stylar disk; between the anthers, on the sides of the stylar organ, are cloven glands or elevated ridges slit longitudinally. Pollen grains in each anther-cell united into waxy pear-shaped masses which are stalked and suspended in pairs from the summit of the cloven glands, each pair of stalks deriving its pollen-masses, not from the cells of one anther, but from contiguous anther-cells of different anthers. Pollination entomophilous; the foot of the insect is caught in the cloven gland or slit, and when drawn upward, drags out and bears away the pollen-masses; in walking over other flowers, the insect's foot is again drawn through a slit, and the pollen-masses are left behind on the stigma, which is concealed beneath the cloven structure. Fruit of 2 follicles. Seeds with a silky tuft of hairs at the micropyle; embryo nearly as long as the seed, the cotyledons plane; endosperm scanty.—Genera 220, species about 1800, all continents, chiefly the warmer regions of the earth.

Bibliog.—Gray, A., Asclepias, etc. [of N. Am.] (Proc. Am. Acad. 12:65–73,—1876); Gonolobus and Lachnostoma (l.c. 74–79,—1876). Greene, E. L., On the classification of Asclepiads (Pitt. 3:231–238,—1897). Vail, A. M., Studies in the Asclepiadaceae (Bull. Torr. Club 24:305–310,—1897; 25:30–39, 171–182,—1898; 26:423–431,—1899; 28:485,—1901; 29:662–668,—1902; 30:178–179,—1903; 31:457–460,—1904). Frye, T. C., Morphological study of certain Asclepiadaceae (Bot. Gaz. 34:389–413, pls. 13–15,—1902). Marsh, C. D., and Clawson, A. B., Asclepias mexicana as a poisonous plant (U. S. Dept. Agr. Bull. 969, p. 1–16, pls. 1–2,—1921); Woolly-pod Milkweed, a dangerous stock-poisoning plant (U. S. Dept. Agr. Circ. 272:1–3,—1923). Marsh, C. D., The Milkweed Family in "Stock-poisoning plants of the range" (U. S. Dept. Agr. Bull. 1245: 25–27, pls. 32–35,—1924). Ball, W. S., & Robbins, W. W., Mexican Whorled or Narrowleaf Milkweed (Mo. Bull. Cal. Dept. Agr. 24:219–220, col. pl.,—1935).

Stems twining.
  Stamen-column without appendages; corolla-lobes cucullate............................1. ASTEPHANUS.
  Stamen-column with appendages; corolla-lobes plane.
    Appendages of the stamen-column attached at base, scale-like....................2. PHILIBERTIA.
    Appendages plate-like, uniting the stamen-column with a corolla-like crown........................ 3. GONOLOBUS.
Stems never twining; stamen-column with appendages.
  Corolla-lobes reflexed; hoods distinct, adnate to the stamen-column above the base.
    Stems strongly flattened, prostrate..4. SOLANOA.
    Stems terete, commonly strictly erect, rarely decumbent.................................5. ASCLEPIAS.
  Corolla-lobes rotate; hoods inserted at base of stamen-column, joined to each other by a lobed disk..6. ASCLEPIODORA.

1. ASTEPHANUS R. Br.

Stems in ours slender, twining. Flowers small, in axillary umbels. Corolla short-campanulate, shortly 5-cleft, glabrous. Appendages of the corolla or stamen-column none.—Species 12, North and South America, Africa. (Greek astephanos, crownless.)

1. **A. utahensis** Engelm. (Fig. 350.) Stems many from the crown of a taproot, diffuse or ascending, 9 to 15 inches long; herbage nearly glabrous; leaf-blades narrowly linear, acuminate, ¾ to 1¼ inches long, spreading or often reflexed; umbels 7 to 16-flowered, the pedicels 2 to 3 lines long; flowers ocher-colored, 1 to 1¼ lines broad; calyx-lobes subulate or lanceolate; corolla glabrous, subcampanulate, shallowly cleft, its short lobes cucullate with the points inflexed, so that the throat is almost closed; stamen appendages none.

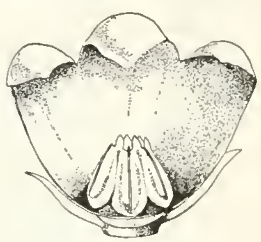

Fig. 350. ASTEPHANUS UTAHENSIS Engelm. Long. sect. of fl., × 11.

Gravelly valleys, 500 to 2500 feet: Colorado Desert; southeastern Mohave Desert. East to Arizona and southern Utah. Apr.-June.

Locs.—San Felipe, *S. B. & W. F. Parish* 1402; Coyote Holes, east of Warrens Well, *Jepson* 5966; Nipton, acc. *P. A. Munz.*

Refs.—ASTEPHANUS UTAHENSIS Engelm., Am. Nat. 9:349 (1875), type loc. St. George, Utah, *Parry;* Jepson, Man. 770, fig. 756 (1925).

2. PHILIBERTIA H.B.K.

Stems in ours twining. Flowers small, dull purplish or yellowish, borne in axillary umbels. Calyx and corolla 5-parted or -cleft. Corolla deeply lobed, with a membranous ring adnate to it at base, pubescent on the outside. Stamen-column short, with 5 scales at base.—Species 30, South America, southern North America. (J. C. Philibert, editor of a French dictionary of botany, 1804.)

Herbage glabrous or nearly so; leaf-blades linear to lanceolate, auriculately or obtusely lobed at base; corolla purplish, its base bearing a narrow but distinct wing-like crown.................... 1. *P. heterophylla.*
Herbage villous-puberulent; leaf-blades tapering or acute at base; corolla greenish-yellow, without crown...2. *P. hirtella.*

1. **P. heterophylla** Jepson. CLIMBING TOWNULA. Stems 2 to 4 or 8 feet long, climbing freely; herbage green, thinly puberulent or glabrous; leaf-blades commonly linear (1 line wide), varying to lanceolate (5 lines wide), obtuse, acute or auriculately lobed at base, 1 to 2 inches long, shortly petioled; pedicels 3 to 6 lines long; flowers 4 to 5 lines broad; calyx-lobes ovate-lanceolate, very acute; corolla purplish, its lobes elliptic-ovate, purple-veined, 2 lines long; base of corolla bearing a narrow but distinct wing-like crown; stamen appendages roundish-ovate, as broad or broader than long.

Dry slopes and flats, 100 to 2000 feet: Colorado Desert and westward toward the coast. East to Texas, south to Lower California and Mexico. Mar.-July.

Locs.—Brawley, *Parish* 8327; Alamo River, Calexico, *Parish* 8328; Box Cañon, Blair Valley, e. San Diego Co., *Jepson* 8708; Palm Cañon of Mt. San Isidro, *Jepson* 8801; San Felipe Gap, *T. Brandegee;* Palm Cañon, Mt. San Jacinto, *Jepson* 1393a; San Gorgonio Pass, *Jepson* 6071; San Bernardino, *Parish* 3814; Claremont, *C. F. Baker* 3676; San Jacinto, *Gregory;* Aguanga, sw. Riverside Co., *Jepson* 1483; Santa Ana Cañon, near Anaheim, *J. T. Howell* 2819; San Luis Rey, San Diego Co. (Syn. Fl. 2:88).

Refs.—Philibertia heterophylla Jepson, Man. 770, fig. 757 (1925). *Sarcostemma heterophyllum* Engelm.; Torr., Pac. R. Rep. 5:362 (1857), type loc. Ft. Yuma, Cal., *Thomas & DuBarry. Philibertia linearis* Gray var. *heterophylla* Gray, Syn. Fl. 2:88 (1878). *Philibertella hartwegii* Vail var. *heterophylla* Vail, Bull. Torr. Club 24:308 (1897). *Philibertella heterophylla* Ckll., Bot. Gaz. 26:279 (1898). *Funastrum heterophyllum* Sta., Contrib. U. S. Nat. Herb. 23:1170 (1924).

2. **P. hirtella** Parish. Trailing Townula. Stems running widely over the ground, often twining a little or climbing over low shrubs, 3 to 10 feet long, the nodes remote; herbage villous-puberulent; leaf-blades linear to linear-lanceolate, acute or acutish at both ends, 1 to 3 inches long, 1 to 4 lines wide, shortly petioled; flowers 2½ lines broad; calyx-lobes linear-lanceolate; corolla greenish-yellow, its lobes ovate, 1 to 1¼ lines long; stamen-appendages subglobose, longer than broad, attached on the inside to the stamen-column and below to the even ridge-like crown borne on the corolla-tube; follicles narrowly lanceolate, attenuate, 2 inches long.

Ravines and dry washes, 500 to 3500 feet: Colorado Desert; eastern Mohave Desert; Inyo Co. East to Arizona and southern Nevada. Apr.-May.

Locs.—Vallecito, e. San Diego Co., *Jepson* 8549a; San Felipe Creek, *T. Brandegee;* Palm Cañon of Mt. San Jacinto, *Newlon* 451; Painted Cañon, Mecca Hills, *Jepson* 11,673; Piñon Well to County Well, Riverside Co., *Jepson* 6010; Pinto Basin, s. Mohave Desert, *Jepson* 12,627; Chuckwalla Mts., *Schellenger;* Lone Willow Spr., near Brown Mt., *Parish* 10,213; Panamint Mts. (Contrib. U. S. Nat. Herb. 4:149).

Refs.—Philibertia hirtella Parish, Muhl. 3:126 (1907); Jepson, Man. 771, fig. 758 (1925). *Sarcostemma heterophyllum* Engelm. var. *hirtellum* Gray, Bot. Cal. 1:478 (1876), type loc. Ft. Mohave, Ariz., *Cooper. Philibertia linearis* Gray var. *hirtella* Gray, Syn. Fl. 2:88 (1878). *Philibertella hirtella* Vail, Bull. Torr. Club 24:309 (1897). *Funastrum hirtellum* Schlechter; Fedde, Rep. Spec. Nov. 13:286 (1914).

3. **GONOLOBUS** Michx.

Ours twining herbs with opposite leaves. Flowers similar to Philibertia, borne in axillary umbels or in ours commonly solitary. Base of corolla (in ours) bearing a cup-like crown attached to the stamen-column by thin plates. Anthers (in ours) with thin scarious appendages inflexed over the summit of the stylar disk.—Species about 70, North and South America. (Greek gonia, angle, and lobos, pod, one of the early species with angled fruits.)

1. **G. hastulatus** Gray. Stems much branched, freely twining, 8 to 14 inches long; herbage puberulent; leaf-blades cordate-sagittate, tapering-acuminate, 3 to 5 lines long, on petioles ½ to ⅔ as long; flowers 1 or rarely 2 in the axils, on pedicels ¼ to ½ line long; peduncles none; flowers dull greenish, 2 lines long; calyx-lobes narrowly lanceolate, obtusish; corolla subrotate, deeply parted into oblong or short-lanceolate lobes, pubescent on the inside; sinuses of the corolla with short but distinct processes downwardly produced; corolla-tube bearing at base a 5-lobed corolla-like crown which is united to the stamen-column by 5 thin vertical lamellae, the crown thus, as it were, 5-celled and nearly equalling the stamen-column.

Dry valleys, 900 to 1100 feet: eastern Mohave Desert; Colorado Desert. South to Lower California. Apr.

Locs.—Kelso, acc. *P. A. Munz;* Cottonwood Sprs., acc. *P. A. Munz;* Yaqui Well.

Refs.—Gonolobus hastulatus Gray, Proc. Am. Acad. 12:78 (1876). *Lachnostoma hastulatum* Gray, Proc. Am. Acad. 11:87 (1876), type loc. Cañon Tantillas, n. L. Cal., *Palmer. Vincetoxicum hastulatum* Hel., Muhl. 1:2 (1900). *G. californicus* Jepson, Man. 771 (1925), type loc. Yaqui Well (Ironwood Well), w. Colorado Desert, *T. Brandegee.*

4. **SOLANOA** Greene

Stems strongly flattened. Umbels small, terminal, globose, densely many-flowered, the peduncles longer than the pedicels. Flowers purplish-red outside, flesh-color within. Hoods cleft dorsally from top to bottom, the ventral side adnate to the filament column. Horns none.—Species 1. (The Indian chief, Solano, of the Suisunes.)

1. **S. purpurascens** Greene. GROUND MILKWEED. (Fig. 351.) Stems 2 or 3 from a stout taproot, about 1 foot long, prostrate, flexuous, purplish and purple-dotted; herbage canescently puberulent; leaf-blades thick, the lowermost elliptic-ovate, the upper broadly cordate-ovate, 1 to 2 inches long; petioles 1 to 2 lines long; umbels 2 or 3; flowers about 2 lines long; hoods brownish-yellow, equaling the filament-column; follicles 2 inches long, about 5 lines in diameter at the widest part.

Montane dry or rocky slopes on disintegrating serpentine, 2000 to 5000 feet: North Coast Ranges from the Mayacamas Range to the Yollo Bolly Mts. June.

Hist. note.—Solanoa purpurascens was first discovered in 1874 by C. B. Towle of the Vallejo High School. Asa Gray, who published the species, wrote of it as from "Lake Co. near the Geysers." The Geysers are in northeastern Sonoma County, and if the plant were found near the Geysers, the locality must be in the Mayacamas Range on the boundary between Sonoma County and Lake County. Towle gave his material of the species to E. L. Greene, rector at Vallejo, who sent a portion to Asa Gray. Greene had no specimens other than those of Towle and doubtless well knew where his friend Towle collected them, since he writes "mountain summits of Sonoma Co., near the Geysers" (Man. Bot. Reg. S. F. Bay 242,—1894). It has, however, never been re-collected in the Mayacamas Range. As to our present knowledge Solanoa purpurascens remains a rare plant and is known to us only from the following localities, all of which are in the Yollo Bolly Mountains: Snow Mt., Lake Co. (trail to Summit Spr. at Cedar Creek), *M. S. Baker;* Fout's Sprs., w. Colusa Co., *Rattan;* Foster Sheep Camp, Soldier Ridge, South Yollo Bolly, *Jepson* 14,533.

Refs.—SOLANOA PURPURASCENS Greene, Pitt. 2:67 (1890); Jepson, Fl. W. Mid. Cal. 384 (1901), ed. 2, 324 (1911), Man. 771 (1925). *Gomphocarpus purpurascens* Gray, Proc. Am. Acad. 10:76 (1874), type loc. "bare summit of a mountain in Lake Co., not far from the Geysers," *Towle* (comm. *Greene*). *Schizonotus purpurascens* Gray, l.c. 12:66 (1876).

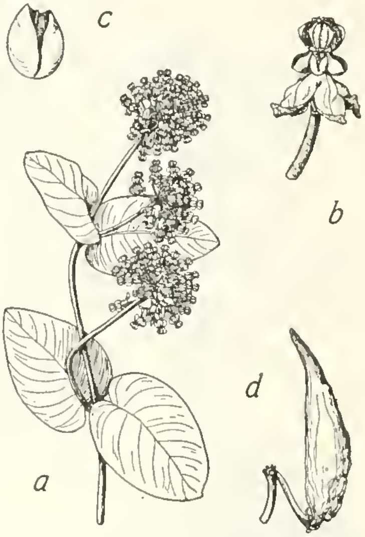

Fig. 351. SOLANOA PURPURASCENS Greene. *a*, flowering branch, × ½; *b*, fl., × 1½; *c*, hood, × 5; *d*, follicle, × ½.

5. **ASCLEPIAS** L. MILKWEED

Stems commonly erect, arising from thick deep-seated roots. Bracts of the involucre usually subulate. Calyx and corolla divisions reflexed, those of the former small, persistent, those of the latter deciduous. Filament-column bearing a circle of 5 hoods, each containing an incurved horn, or hornless. Anther wings (forming the sides of the cloven gland) widened towards the truncatish base. Follicles ovate or lanceolate, one often abortive, erect or ascending, or pendulous or descending in A. subulata. Seeds anatropous, flat, margined, imbricated on the large placenta. Embryo large, with broad foliaceous cotyledons in thin endosperm.—Species 80, North and South America, Africa. (Asklepios, Greek name of the celebrated ancient physician of Asia Minor, Aesculapius.)

A. Horns present in the hoods.

Hoods equaling or shorter than the anther-column.
  Leaves broad; follicles erect or ascending, on deflexed pedicels; herbage woolly, sometimes glabrate in age.

Lateral umbels sessile, or short-peduncled, the terminal one peduncled; hoods truncatish, a pair of slender teeth inserted between them on the stamen-column; horns wing-like, attached by their whole length to the dorsal side of the hoods within, not exserted; cismontane............1. *A. vestita.*

Umbels all peduncled; hoods more or less truncate, sometimes obliquely so, no teeth-like processes between them.

Hoods saccate; horns crest-like, attached dorsally all the way to the summit of the hood, the acute or sickle-shaped apex barely projecting or included; cismontane............2. *A. eriocarpa.*

Hoods spreading; horns attached at base of hood or below middle, strongly exserted, curving over the disk of the stigma; transmontane deserts and upper San Joaquin Valley............3. *A. erosa.*

Leaves narrow or none; follicles erect, on erect pedicels; herbage glabrous.

Stems very leafy; hoods rounded at apex, the horns much exserted; filament-column about as long as the anther-column; throughout Cal............4. *A. mexicana.*

Stems naked at flowering time, the leaves early deciduous; hoods truncate at apex, the horns scarcely exserted; filament-column shorter than the anther-column; Colorado Desert............5. *A. albicans.*

Hoods twice or thrice as long as the anther-column; filament-column very short or none; pedicels deflexed in fruit.

Hoods open, long-lanceolate above the broad base, very conspicuous; widely distributed............6. *A. speciosa.*

Hoods with the sides closely appressed, the horn a wing-like crest attached towards the apex; Mohave and Colorado deserts.

Leaves broad; stems decumbent............7. *A. nyctaginifolia.*

Leaves narrow or none; stems erect, rush-like............8. *A. subulata.*

B. No horns to the hoods; pedicels deflexed in fruit.

Hoods rounded, cleft half-way down the back, shorter than the anther-column; filament-column long; herbage white-tomentose............9. *A. californica.*

Hoods conical, open down the front, a little exceeding the anther-column; filament-column short; herbage glabrous............10. *A. cordifolia.*

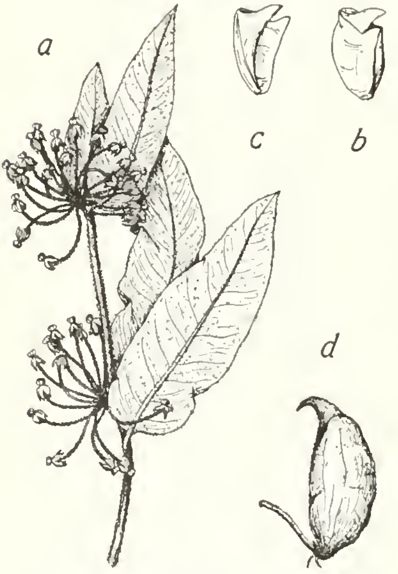

Fig. 352. Asclepias vestita H. & A. *a*, fl. branchlet, × ½; *b*, hood, × 6; *c*, long. sect. of hood, × 6; *d*, follicle, × ⅓.

1. **A. vestita** H. & A. Woolly Milkweed. (Fig. 352.) Stems several from the root-crown, erect or ascending, ¾ to 2 feet high; herbage white-woolly, the wool at length largely deciduous; leaves in whorls of 2, the leaf-blades ovate or mostly oblong-lanceolate, often subcordate at base, 2 to 6 inches long, the upper more acuminate, all short-petioled or the upper sessile; umbels 1 to 4, the lateral sessile or very short-peduncled, the terminal peduncled; corolla yellowish-white or purplish, tomentose on the outside, its lobes 3 lines long; hoods marble-white, aging yellow, truncate at summit and entire, auriculate-lobed or acute at the inner angle and open down the front, bearing a longitudinal brown band on the back, about as long as the stamen-column; cloven glands with a pair of linear teeth inserted beneath them on the stamen-column; horn or crest blunt, not exserted, attached to the back of the hood from the base to the summit, produced upward and forward into a short blunt point; follicles ovate, acute, 2½ inches long, 1 inch wide.

Dry plains and low hills, 50 to 4000 feet: Sierra Nevada foothills from San Joaquin Co. to Fresno Co. and the bordering San Joaquin Valley plain; South Coast Ranges from western Stanislaus Co. to Monterey Co. and San Luis Obispo Co.; Santa Barbara Co. Apr.-May; fr. Aug.

Locs.—Sierra Nevada foothills: Clements, ne. San Joaquin Co., *Jepson* 1823c; Knights Ferry, *Jepson* 8338; Ahwahnee, Mariposa Co., *Jepson* 12,824; Friant, Fresno Co., *Jepson*. San Joaquin Valley: betw. Mossdale and Atlanta, *Jepson* 14,541; Atwater, Merced Co., *Jepson* 12,755. South Coast Ranges: Orestimba Cañon, w. Stanislaus Co., *Hoover* 2604; San Miguel, *E. P. Unangst;* Templeton, *Davy* 7567. Santa Barbara Co.: Carpinteria, acc. *Peirson*. The citation of San Diego Co. by Gray (Syn. Fl. 2:94) and of Alameda and San Francisco Cos. by Greene (Man. Reg. S. F. Bay 242) are all probably errors. In the Mohave Desert and in Inyo Co. the species passes into the var. PARISHII Jepson: leaves narrower, very acuminate, glabrate; corolla purple; teeth beneath the cloven glands much reduced.—Desert flats or slopes: north base of the San Bernardino Mts. (Cajon Pass; Rabbit Sprs., *Hall & Chandler*); Inyo Co. (Skinner Cañon, *S. W. Austin* 627).

Refs.—ASCLEPIAS VESTITA H. & A., Bot. Beech. 363 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 383 (1901), ed. 2, 323 (1911), Man. 772 (1925). Var. PARISHII Jepson, Man. 772, fig. 759 (1925), type loc. Cajon Pass, *Jepson* 6116.

ASCLEPIAS CRYPTOCERAS Wats., Bot. King 283, pl. 28, figs. 1–4 (1871), type loc. West Humboldt Mts., near Humboldt Lake, Nev., *Watson* 961. Stems decumbent, 9 to 15 inches long; herbage glabrous; leaf-blades 3 or 4 pairs, round-ovate, apiculate, 1½ to 2¾ inches long; petioles 1 to 2 lines long; umbels 1 to 3, 6 to 10-flowered, the lateral ones sessile, the terminal peduncled; flowers 8 to 11 lines long; corolla greenish-yellow; hoods equaling the anther-column, flesh-color, saccate-ovate, cleft at apex as far back as the dorsal angle, the 2 lobes ending in abruptly acute points; horns included, slender, united to the back of the hood, only the upper forward-curving portion free; follicles ovate, shortly attenuate, 1½ to 2½ inches long.—Sandy hillsides, western Nevada, 4000 to 7000 feet: Mt. Montgomery sta., Mineral Co., *Shockley* 362, and Lawtons Sprs., near Verdi, Washoe Co., *Sonne*, stations within 4 to 8 miles of the California line. Idaho to Utah. May-June.

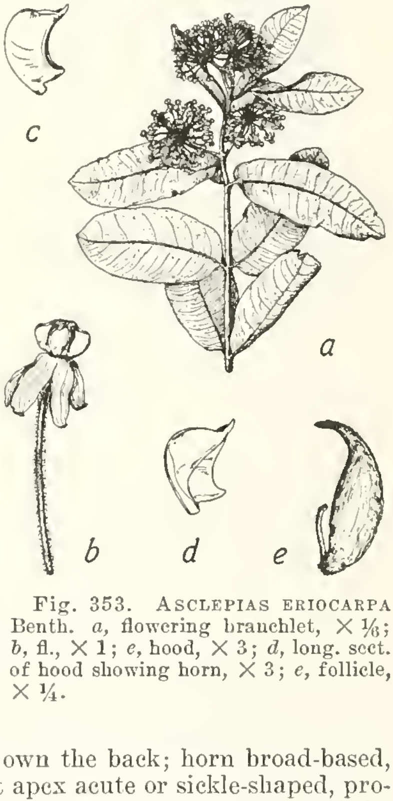

Fig. 353. ASCLEPIAS ERIOCARPA Benth. *a*, flowering branchlet, × ⅙; *b*, fl., × 1; *c*, hood, × 3; *d*, long. sect. of hood showing horn, × 3; *e*, follicle, × ¼.

2. **A. eriocarpa** Benth. INDIAN MILKWEED. (Fig. 353.) Stem 1½ to 3 feet high, more or less sharply angled below; herbage hoary-tomentose, the hairs short, not cobwebby, in age more or less deciduous; some of the leaves in whorls of 3 to 5, the blades of all broadly oblong with truncate or subcordate (or rarely rounded) base, rounded or acute (rarely acuminate) at apex, 4 to 7 (or 9) inches long; petioles very short (1 to 3 lines long); umbels few or several, mostly corymbose-clustered toward the summit, on peduncles equaling or rather longer than the pedicels; flowers 3½ lines long; corolla creamy-white; hoods pink or purplish tinged, shorter than the stamen-column, roundish, truncatish at top, as if closed, but with a narrow slit which often extends a short distance down the back; horn broad-based, attached behind by its entire base to the hood, at apex acute or sickle-shaped, projecting forward though but little protruded from between the acute teeth of the hood; corolla and hoods soon changing to buckskin color; follicles oblong, 2½ to 3½ inches long, abruptly attenuate at the curved apex.

Dry barren valleys or foothills, or desert washes, 100 to 2000 feet, or up to 5500 feet southward: Sierra Nevada foothills from Shasta Co. to Tulare Co.; Tehachapi Mts.; Sacramento Valley; Coast Ranges from Mendocino Co. to Monterey Co.; southward to Southern California. Lower California. July-Aug.

Field note.—The bast fibres were used by the Indians on the Kaweah River for making ropes, strings for bows, and broad "no-end" bands for carrying over the head the squaw burden-basket. The women of the white settlers use the silky coma of the seeds as a sort of floss for scent-bags; it is much superior to cotton. The herbage is a dangerous poison to sheep.

Locs.—The plants of the South Coast Ranges are taken as exactly representative of Asclepias eriocarpa Benth. We find also through the North Coast Ranges and Sierra Nevada foothills in dry flats and summer flood beds of winter streams a milkweed which is extremely uniform in character and agrees in every particular with the plants of the South Coast Ranges just noted: in habit, in aspect, in foliage, in inflorescence, in every detail of the flowers and in fruits. It seems unlikely, therefore, that there exists in the Sacramento Valley region a lost species, A. fremontii Torr., with definitely differentiating characters. Specimens of the North Coast Ranges distributed as Asclepias fremontii by W. W. Eggleston, who made special field studies of this species, agree quite in details of flower structure with the type of A. eriocarpa Benth. (Kew, W. L. J. 1906). Later, Eggleston concluded his studies, arrived at the same conclusion and in 1926 made verbally the statement: "There is no difference in flowers between Asclepias fremontii and A. eriocarpa. None at all." (Jepson Field Book, 44:180. ms.). As a matter of ecological consideration it is probable that neither Asclepias eriocarpa, nor any form of it such as A. fremontii, is properly a dweller in humus soils on the flood-plain floors of the Sacramento Valley. Asclepias eriocarpa is known in the valley thus far only in gravel beds or on terraces or benches of streams as a waif from the hills, or as occurring on higher ground about the Marysville Buttes, a hilly "island" set in the floor of the plain, or in clay or adobe situations. In support of the general range of Asclepias eriocarpa in California we cite the following localities. Sierra Nevada: Payne Creek, Tehama Co., *Jepson* 12,342; Oroville (foothills e.), *Heller* 11,573; Nevada City, *Jepson* 16,766; Shaver Lake ranger sta., Fresno Co., *Jepson* 16,101; Three Rivers, *Jepson* 563. Tehachapi Mts.: Double Mt., *Jepson* 7424. Sacramento Valley: Redding, *Blankinship;* Jelleys Ferry, Tehama Co., *Jepson* 18,985; Marysville Buttes; Dunnigan, Yolo Co., *Jepson* 12,251. Coast Ranges: Round Valley, ne. Mendocino Co., *Jepson;* Long Valley, cent. Mendocino Co., *Jepson* 9446; Ukiah, *Jepson* 2253; Big Valley, Lake Co., *Jepson* 14,535; Knights Valley, Sonoma Co., *Jepson* 7433; Pope Creek, e. Napa Co., *Jepson* 14,536; Soda Creek (5 mi. s. of Monticello), e. Napa Co., *Jepson* 17,654; Putah Pass, *Jepson* 14,534; Stone Cañon, e. Monterey Co., *Jepson* 15,920; Soledad, Monterey Co., *Congdon;* Cold Spr., near Posts, Santa Lucia Mts., *Jepson* 2599; Nacimiento River valley, *Jepson* 1700. S. Cal.: Mono Flat ranger sta., Santa Barbara Co., *A. L. Grant* 1743; Ojai Valley, *Olive Thacher* 32; Rubio Cañon, San Gabriel Mts., *Peirson* 148; Cajon Pass, *Jepson* 6100; San Bernardino, *Parish;* Santa Ana Cañon, Orange Co., *J. T. Howell* 2785; Santa Rosa Mts., *Clary* 1208; Palomar Mt., *S. G. Stokes;* Escondido, *C. V. Meyer* 447; Things Valley (15 mi. n. of Campo), *Parish* 1930.

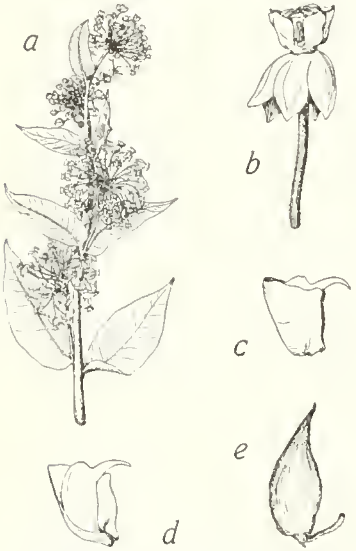

Fig. 354. ASCLEPIAS EROSA Torr. *a,* fl. branchlet, × ¼; *b,* fl., × 1½; *c,* hood, × 3¼; *d,* long. sect. of hood, showing the horn, × 3¼; *e,* follicle, × ⅓.

Var. **microcarpa** M. & J. Follicles short (1⅓ to 1¾ inches long).—San Bernardino Mts., 6000 feet.

Refs.—ASCLEPIAS ERIOCARPA Benth., Pl. Hartw. 323 (1849), type loc. Tularcitos, nw. Monterey Co., *Hartweg* 127; Jepson, Fl. W. Mid. Cal. 383 (1901), ed. 2, 323 (1911), Man. 772 (1925). *A. fremontii* Torr.; Gray, Syn. Fl. 2:93 (1878), type loc. "upper Sacramento," *Fremont* (i.e. Marysville Buttes, acc. W. W. Eggleston); McCumber, McCloud River, *Newberry* (Pac. R. Rep. 6:87,—1857); Jepson, Fl. W. Mid. Cal. 383 (1901), ed. 2, 323 (1911), Man. 773 (1925). *A. kotolo* Eastw., Zoe 5:86 (1900), 98 (1901), type loc. Ukiah, *J. M. Hudson*. Var. MICROCARPA M. & J., Bull. Torr. Club 49:355 (1922), type loc. North Fork Deep Creek, San Bernardino Mts., *Johnston* 2833.

3. **A. erosa** Torr. DESERT MILKWEED. (Fig. 354.) Stems 2 to 3½ feet high; herbage finely white-woolly, eventually more or less glabrate; leaves in whorls of 2, the blades ovate or ovate-lanceolate, acute or acuminate, 5 to 8½ inches long, sessile; pedicels 1 to 1¼ inches long, longer or shorter than the peduncles; flowers very pale cream-color or greenish; hoods when outspread orbicular-obovate with rounded entire or truncatish summit, scarcely exceeding the stamen-column; horns broadly falcate, attached below the middle or at base, exserted from the hood and incurving over the central disk, shaped much like an inverted Lupine keel; follicles oblong-ovate, attenuate at apex, 2½ to 3¼ inches long.

Dry hills, 500 to 5000 feet: Inyo Co.; southern Sierra Nevada in Kern Co.; upper San Joaquin Valley; Mohave and Colorado deserts and bordering ranges. East to Utah and Arizona. May-July.

Field note.—The white sap is collected by the Coahuillas in a vessel, allowed to solidify and then chewed. "Its bitter taste disappears after a little and a tasteless gum is left which affords inexhaustible satisfaction to the user."—Barrows, Ethno-Bot. Coahuilla Indians, 7.

Locs.—Upper San Joaquin Valley: Earlimart, Tulare Co., *Hoover* 2675; Edison, Kern Co., *Hoover* 668; Caliente, Kern Co., *Jones.* Southern Sierra Nevada in Kern Co.: Kernville, *K. Brandegee.* Inyo Co.: Panamint Mts. (Contrib. U. S. Nat. Herb. 4:149); Silver Lake, *Parish* 10,376. Mohave Desert: Cima, *Jepson* 15,843; Bagdad, *K. Brandegee;* Calico Mts., *Jepson* 4808; Fairmount, Antelope Valley, *Hall* 6710. Colorado Desert: Lookout Mt., n. of Indio, *Jepson* 5977; Palm Sprs. of San Jacinto, *Jepson* 6064; Palm Cañon, San Jacinto Mts., *Jepson* 1346; Silent Cañon, se. end of Santa Rosa Mts., *Jepson* 11,714; betw. Kane Spr. and Oasis, *C. V. Meyer* 411; San Felipe Wash, e. San Diego Co., *Jepson* 8896; Carrizo Creek, sw. Colorado Desert, *T. Brandegee.*

Refs.—ASCLEPIAS EROSA Torr., Bot. Mex. Bound. 162 (1859), type loc. Metate, Gila River valley, Ariz., *Schott, Thurber;* Jepson, Man. 773 (1925). *A. leucophylla* var. *obtusa* Gray, Bot. Cal. 1:620 (1876), type loc. Bartlett's Cañon, Santa Barbara Co., *Rothrock* (a form with very obtuse leaves). *A. erosa* var. *obtusa* Gray, Syn. Fl. 2:94 (1878).

4. **A. mexicana** Cav. NARROW-LEAF MILKWEED. (Fig. 355.) Stem slender, 2 to 4 (or 7) feet high; herbage glabrous; leaf-blades linear to linear-lanceolate, in whorls of 3 to 6, or the lower and uppermost opposite, 2½ to 6 inches long, 2 to 6 (or 9) lines broad, short-petioled; umbels many, often in whorls or corymbose, densely many-flowered, on peduncles longer than the pedicels; flowers small, greenish-white or tinged with purple; corolla-lobes oblong, 2 lines long; hoods about equaling the stamen-column; horns slender, subulate, exserted and incurved over the summit of the disk; follicles lanceolate, 3 to 4 inches long, about 4 lines thick at the widest part; seeds 3½ lines long.

Forming colonies in dry ground of valleys and foothills, 1 to 6500 feet: almost throughout California but mostly absent from the deserts and not on the immediate coast northward. North to Washington, east to Utah, south to Mexico. June-Sept.

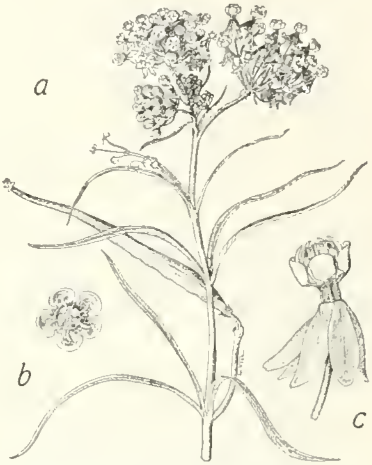

Fig. 355. ASCLEPIAS MEXICANA Cav. *a*, fl. branchlet, × ½; *b*, hoods and stamen-column seen from above, × 2; *c*, fl., × 2.

Field note.—Asclepias mexicana has an evil reputation among stockmen. The herbage is doubtless poisonous to cattle, but is only mildly toxic as compared with Asclepias galioides of Arizona and New Mexico. The plant propagates by underground roots, especially under cultivation, and in some places tends to become a minor agricultural pest. Small colonies have been known to persist for 70 years in cultivated fields in Vaca Valley. In this particular A. speciosa holds a similar record. From the juice of A. mexicana the native tribes obtained a gum which they used for adhesive purposes.

Locs.—Inyo Co.: Silver Cañon, White Mts., *Jepson* 7419; Bishop, comm. *C. L. Hill;* Lone Pine, *Jepson.* Sierra Nevada: Lost Lake, Modoc Co., *L. S. Smith* 1034; Whitmore, Shasta Co., *A. A. Weigart;* Manton, Tehama Co., *Jepson;* Martin Sprs., Eagle Lake, *Brown & Wieslander* 31; Belden, Plumas Co., *Jepson;* Hetch-Hetchy, *Jepson;* Mono Hot Sprs., South Fork San Joaquin River, *A. L. Grant* 1496; Markwood Mdw., Fresno Co., *Jepson;* Hospital Rock, Middle Fork Kaweah River, *W. Fry.* Great Valley: Redding, *Blankinship;* Chico, *Dutton;* Norman, Glenn Co., *Davy;* Vacaville, *Jepson* 8411; Union Isl., San Joaquin Co., *Jepson* 10,277; Four-mile Slough, cent. Fresno Co., *Jepson* 13,317; Greenfield, near Bakersfield, *Davy* 1855. Coast Ranges: Hupa, Humboldt Co., *Manning;* Mail Ridge, n. Mendocino Co., *Jepson* 16,525; Walker Valley, Mendocino Co., *Jepson;* Hopland, *Jepson;* Wilbur Sprs., sw. Colusa Co., *Jepson;* Alexander Valley, Sonoma Co., *Jepson* 9487; Guinda, Yolo Co., *Rowena Beans;* Cordelia, *Jepson* 3078; Milpitas, *R. J. Smith;* San Luis Obispo, *Summers* 539. S. Cal.: Lompoc, comm. *C. W. Beers;* Victorville, *Parish* 10,602; Ojai Valley, *Olive Thacher* 33a; Los Angeles, *E. D. Palmer;* San Antonio Cañon, San Gabriel Mts., *Peirson* 149; San Bernardino, *Parish;* Anaheim Creek, Orange Co., *Booth* 1291;

Escondido, *C. V. Meyer* 224; San Diego, *M. F. Spencer;* Witch Creek, *Alderson.* An extremely broad-leaved form with ovate-lanceolate blades 4 to 5 inches long and 1 to 2 inches wide grows in the high mountains of Fresno Co.: Cressman School, Pine Ridge, 4500 feet, *Jepson* 13,294; Rae Lake, 10,600 feet, *Peirson* 885. No geographic significance attaches to this montane Fresno County form, since broad-leaved plants with blades ¾ to 1 inch wide are sometimes found on the floors of the low valleys (Walnut Creek; Sites, Colusa Co.).

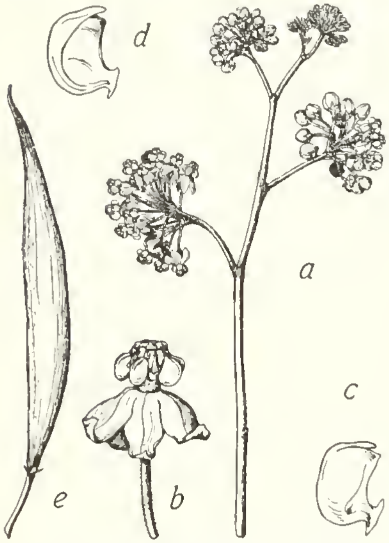

Fig. 356. ASCLEPIAS ALBICANS Wats. *a*, fl. branchlet, × ¼; *b*, fl., × 1½; *c*, hood, showing the slender exserted horn at summit, × 4; *d*, long. sect. of hood, × 4; *e*, follicle, × ½.

Refs.—ASCLEPIAS MEXICANA Cav., Ic. 1:42, pl. 58 (1791), type from Mexico; Jepson, Fl. W. Mid. Cal. 382 (1901), ed. 2, 323 (1911), Man. 773, fig. 760 (1925). *A. fascicularis* Dec.; DC., Prod. 8:569 (1844), type from Cal., *Douglas. A. macrophylla* var. *comosa* D. & H., Pac. R. Rep. 5^3:10, pl. 8 (1855), Posé Creek, Kern Co., *Heermann.*

5. **A. albicans** Wats. WAX MILKWEED. (Fig. 356.) Stem 3 to 10 feet high, the epidermis waxy white; herbage glabrate, the pedicels pubescent; leaves in 3s, early deciduous, the blades narrowly linear; peduncles ½ to 1 inch long; umbels in a terminal panicle; pedicels 4 to 5 lines long; corolla greenish-brown; hoods yellowish, saccate, truncatish, cleft along the top, about ½ as long as the anther-column; horns slender, a little exserted; pedicels and follicles erect, the latter slender, waxy, 4 inches long, 5 lines wide.

Rocky outcrops or in washes, 200 to 2500 feet: southeastern Mohave Desert; Colorado Desert. East to Arizona, south to Lower California. Mar.-Apr.

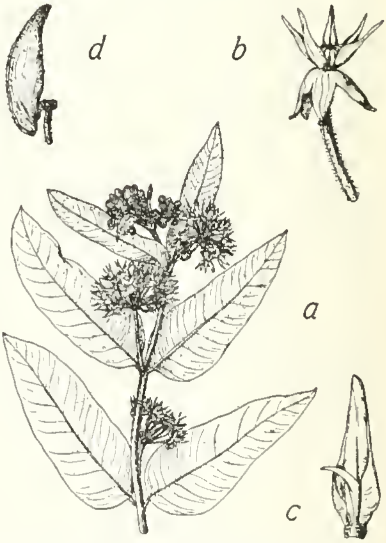

Fig. 357. ASCLEPIAS SPECIOSA Torr. *a*, flowering branchlet, × ⅙; *b*, fl., showing the ascending hoods and reflexed corolla, × ⅔; *c*, hood and horn, × 2; *d*, follicle, × ⅙.

Field note.—A characteristic habitat note taken from the field record is as follows: Our way leads westerly across the Colorado Desert and we are now approaching the Jacumba Mts. An Asclepias (A. albicans) grows in the rocks to the right of the wagon trail, its clusters of tall stems (five to eight feet high) forming picturesque objects on the summits of the boulder-piled crags sixty to one hundred feet above the bed of the wash of Myers Creek. It also grows on the gentler rocky slopes where it is equally prosperous, but not so striking in appearance. This station is on the western margin of Imperial County, near the Myers Creek bridge at the foot of the Mountain Springs grade (Jepson Field Book, 45:85, 93. ms.).

Locs.—Southeastern Mohave Desert: Sheep Hole Mts. (Bull. S. Cal. Acad. 34:183); Whipple Mts., *Peirson* 11,503; Pinto Mts., *Hall* 6025. Colorado Desert: Santa Rosa Mts. (8 mi. sw. of Coachella), *Clary* 178; Agua Caliente near Vallecito, *T. Brandegee;* Myers Creek bridge, foot of Mountain Springs grade, *Jepson* 11,780a.

Ref.—ASCLEPIAS ALBICANS Wats., Proc. Am. Acad. 24:59 (1889), type loc. Los Angeles Bay, L. Cal., *Palmer* 588; Jepson, Man. 773 (1925).

6. **A. speciosa** Torr. CREEK MILKWEED. (Fig. 357.) Stem stout, 2 to 4½ feet high, leafy to the top; herbage soft-tomentose, or rarely glabrate in age; leaves in whorls of 2, the blades oval or ovate to oblong or oblong-lanceolate, transversely veined, commonly acute, 4 to 7 inches long; petioles

3 to 5 lines long; peduncle longer than the woolly pedicels; lower umbels with 6 to 10 flowers, the upper with 18 to 55; corolla brown-pink or reddish-purple; hoods pinkish-white, aging yellowish, with a broad involute base, above this abruptly contracted into a nearly flat lanceolate portion, the whole 2 to 2½ times as long as the stamen-column; horns much exserted, incurved over the central disk; follicles ovate, soft-spiny, at least toward the apex, 3 to 3½ inches long, 1 to 1¼ inches thick.

Valley flats and along waterways, 10 to 4500 (or 6500) feet: North Coast Ranges from Solano Co. to Siskiyou Co.; Sacramento Valley; Sierra Nevada from Fresno Co. to Plumas Co.; east side Sierra Nevada from Inyo Co., Cal. to Washoe Co., Nev. North to Washington, east to Arkansas. May-Aug.

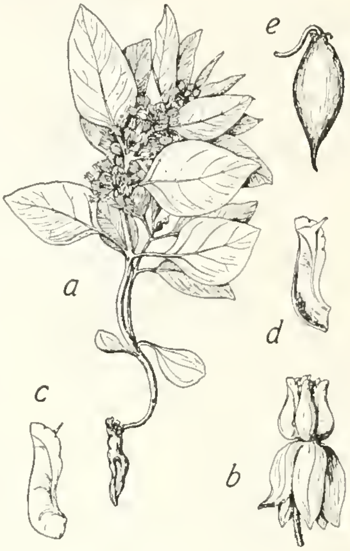

Fig. 358. ASCLEPIAS NYCTAGINIFOLIA Gray. *a*, habit, × ¼; *b*, fl., × 1½; *c*, hood, × 2½; *d*, long. sect. of hood, × 2½; *e*, follicle, × ⅓.

Geog. note.—Asclepias speciosa lives in a wide variety of climates, since it inhabits all states west of the Mississippi River (U. S. Dept. Agr. Bull. 1245:25). In California it grows under conditions of marked diversity from the hot dry plains of the Sacramento Valley nearly at sea-level to the high cool cañons of the Sierra Nevada at Mono Hot Springs on the South Fork of the San Joaquin River at 6500 feet. In western Solano County the plants are more white-woolly than usual and the leaves very broad (mostly 3 to 4⅜ inches) and very obtuse at apex. Aside from this Solano variation the species is fairly uniform in aspect in California and remarkably constant in flower character throughout its entire range.

Locs.—North Coast Ranges: Cordelia, *Jepson;* Lagoon Valley, w. Solano Co., *Jepson* 9065; Allen Sprs., Lake Co., *D. Cleveland;* Hy-am-pum, Trinity Co., *Chesnut & Drew;* Cecilville, Siskiyou Co., *Jepson;* Sisson, *Jepson* 14,539; Yreka, *Butler* 1557. Sacramento Valley: Alamo Creek, nw. Solano Co., *Jepson* 8197. Sierra Nevada: Kings Cañon, *Jepson;* Mono Hot Sprs., Fresno Co., *A. L. Grant* 1498; Chiquito Creek, South Fork San Joaquin River, *A. L. Grant* 1392; Yosemite, *Jepson* 8356; Hetch-Hetchy, *Jepson;* Standard City, Tuolumne Co., *A. L. Grant;* Bear Valley, Nevada Co., *Jepson* 14,540; Donner Lake, *Heller* 7169; Meadow Valley, Plumas Co., *Fritz & Harris;* Belden, Plumas Co., *Jepson.* East side of Sierra Nevada: Independence, *Alice Rhine;* Bishop, *Shockley* 377. Nev.: Reno, *Jepson* 14,538.

Refs.—ASCLEPIAS SPECIOSA Torr., Ann. Lyc. N. Y. 2:218 (1828), type coll. by *James* (Canadian River); Jepson, Fl. W. Mid. Cal. 383 (1901), ed. 2, 323 (1911), Man. 773 (1925).

ASCLEPIAS GIFFORDII Eastw., Proc. Cal. Acad. ser. 4, 20:150 (1931), type loc. Tuolumne, Tuolumne Co., *E. W. Gifford* (July, 1913), (typ. vidi). Habit, tomentum, leaves and inflorescence similar to A. eriocarpa; ribbing of leaves and size of flowers similar to A. speciosa; corolla-lobes light buckskin color, tomentose below, microscopically puberulent above; hoods very obliquely truncate in such a manner as to make a short point dorsally, the back with a marked lanceolate thickening ending in the dorsal point; horns wing-like, their slender points exserted, their bases attached from the base of the hood to within ⅔ of the distance to the apex.—Known only from the type locality. "It is unlike the other related species of California in that the corona surpasses the anther column, and in the notched anther wings" (ex char.). Its position seems intermediate between A. eriocarpa and A. speciosa. More material is needed but search for this plant at the type station has been unsuccessful.

7. **A. nyctaginifolia** Gray. MOHAVE MILKWEED. (Fig. 358.) Stems several from the base, decumbent or ascending, 6 to 8 inches long; herbage green, finely puberulent; leaf-blades ovate, acute, 2 to 4 inches long, on petioles ½ to 1 inch long; umbels subsessile; corolla thinnish, greenish; hoods narrowly oblong, over twice as long as the stamen-column, the sides closely appressed; horn wing-like, attached towards the apex and produced into a subulate exserted point; follicles narrowly ovate, attenuate, 2 to 2½ inches long.

Dry slopes, 4000 to 5000 feet: Providence and New York mountains in the eastern Mohave Desert. East to Arizona. May-June.

Locs.—Lanfair, *M. L. Tennent;* Barnwell, *T. & K. Brandegee.*

Refs.—ASCLEPIAS NYCTAGINIFOLIA Gray, Proc. Am. Acad. 12:69 (1876), type loc. Rock Spr., Providence Mts., *Palmer;* Jepson, Man. 774 (1925). *Podostemma nyctaginifolia* Greene, Pitt. 3:237 (1897).

8. **A. subulata** Dec. RUSH MILKWEED. (Fig. 359.) Stems in clusters, erect, straight, rush-like, leafless or with a few filiform leaves, 3 to 8 feet high; herbage glabrous; umbels 6 to 14-flowered, 1 to 1½ inches wide; pedicels 6 to 8 lines long; flowers dull yellowish-white; hoods elongated, twice the length of the stamen-column, the 2 sides pressed together like a lupine keel and somewhat scimitar-shaped in outline; horn a thin wing, borne above the middle, its short sharp point scarcely exserted from the folded hood; follicles slender, long-acuminate, 2 to 5¼ inches long.

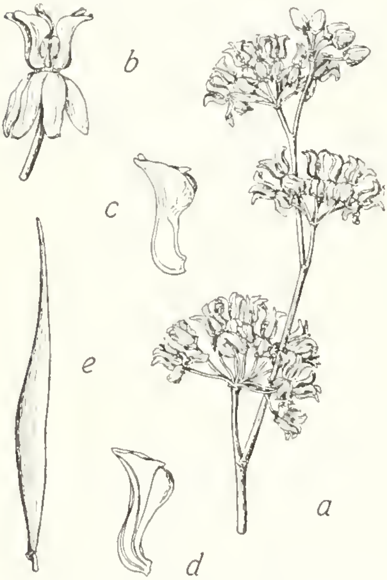

Fig. 359. ASCLEPIAS SUBULATA Dec. *a*, flowering branchlet, × ½; *b*, fl., × 1; *c*, hood, × 2; *d*, long. sect. of hood showing the short horn, × 2; *e*, follicle, × ⅓.

Desert washes, 100 to 1500 feet: eastern Mohave Desert; Colorado Desert. East to southern Nevada and south to Lower California. Apr.-Sept.

Locs.—Bagdad, *T. Brandegee;* Riverside Mts., Colorado River, *Jepson* 5236; Whitewater, acc. *Peirson;* County Well, n. of Indio, *Jepson* 6030; Shaver Well, *Jepson* 12,547; betw. Kane Spr. and Oasis, *C. V. Meyer* 412; Vallecito, e. San Diego Co., *Jepson* 8633. Nev.: Searchlight, *Parish* 10,301.

Refs.—ASCLEPIAS SUBULATA Dec.; DC., Prod. 8:571 (1844), type loc. "Nov. Hispania, *Pavon*," that is, Mexico, but probably *Sessé & Mociño* (since "Pavon himself was never in Mexico," cf. Hemsley in Godman & Salvin, Biol. Cent.-Am. 4:120); Torr., Pac. R. Rep. 5:362, pl. 7 (1857); Jepson, Man. 774 (1925).

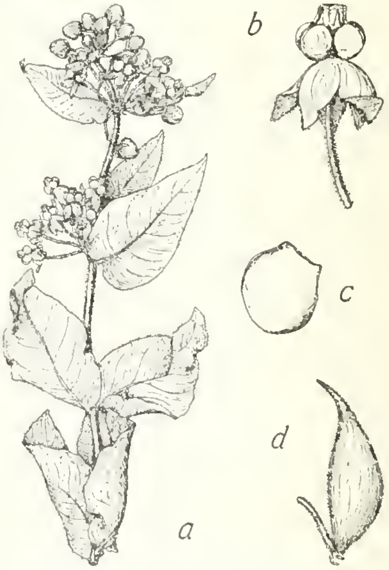

Fig. 360. ASCLEPIAS CALIFORNICA Greene. *a*, fl. branch, × ⅓; *b*, fl., × 1; *c*, hood, × 2½; *d*, follicle, × ½.

9. **A. californica** Greene. ROUND-HOOD MILKWEED. (Fig. 360.) Vegetative aspect of A. vestita; stems 12 to 22 inches high; herbage white-tomentose, somewhat cobwebby, the tomentum on the stems persistent, on the leaves largely deciduous; leaves in whorls of 2, the blades oval to ovate or oblong-lanceolate, sharply acuminate, 1½ to 3 inches, the lower to 6 inches long; petioles 1 to 6 lines long; umbels nearly sessile, about 6 to 9-flowered; corolla purplish; hoods dark maroon, semiorbicular, laterally compressed, centrally attached and reaching nearly to the middle of the anthers, 2-cleft half-way down the back and destitute of horn, shorter than the stamen-column; follicles ovate, very acute, 1¾ to 2 inches long.

Dry, grassy or sparsely wooded slopes, 1200 to 6000 feet: South Coast Ranges; Sierra Nevada in Tulare and Kern Cos.; south to San Diego Co. Lower California. May-June.

Locs.—South Coast Ranges: Mt. Diablo (near upper Pine Cañon), *F. A. Leach;* San Antonio trail, Santa Lucia Mts., *Jepson* 1661; Treat ranch, upper San Benito River, *Jepson* 12,206; Los Gatos Creek (head of), w. Fresno Co., *Jepson* 12,190. Tulare and Kern Cos.: Badger road, e. of Orosi, *H. P. Kelley;* Lloyd Mdws., Kern River, *Jepson* 4893; Greenhorn Mts., *Krames.* Tehachapi Mts.: Caliente, *Jepson* 15,436. S. Cal.: Mt. Pinos, *Hall* 6398; Rock Creek, San Gabriel Mts., *Peirson* 3541; Cajon Pass, *Jepson* 6109; San Bernardino Valley, *Jepson* 5583; betw. Vandeventer Flat and Coyote Cañon, Santa Rosa Mts., *Jepson;* Elsinore, *Jepson* 12,426; Mesa Grande, San Diego Co., *E. Ferguson* 7; Julian, *T. Brandegee;* San Diego, *M. F. Spencer.*

Refs.—ASCLEPIAS CALIFORNICA Greene, Erythea 1:92 (1893); Jepson, Fl. W. Mid. Cal. 384 (1901), ed. 2, 324 (1911), Man. 774 (1925). *Acerates tomentosa* Torr., Bot. Mex. Bound. 160, pl. 44 (1859), type loc. mts. east of San Diego, *Parry. Gomphocarpus tomentosus* Gray, Bot. Cal. 1:477 (1876); var. *xantii* Gray, l.c., type loc. Ft. Tejon, *Xantus.*

10. **A. cordifolia** Jepson. PURPLE MILKWEED. Stems 1½ to 2½ feet high; herbage green and more or less purplish, perfectly glabrous; leaves mostly in whorls of 2, rarely in 3s, the blades ovate and mostly acute, the upper varying to ovate-lanceolate, the lower varying to elliptic-ovate or orbicular, all sessile with cordate-clasping base, 2 to 4 inches long; umbels loosely many-flowered, the filiform pedicels equaling or shorter than the peduncles; corolla dark red-purple, its lobes 3 to 4 lines long; hood purplish, oblong, the summit obliquely truncate dorsally and produced at the ventral margins into an ascending cusp, the fissure down the front narrow; follicles lanceolate to oblong, often long-attenuate, glabrous, 2 to 3¼ (or 5) inches long.

Open or openly wooded slopes, from the foothills, 500 feet, up to 5000 feet: North Coast Ranges from Siskiyou Co. to Solano Co.; Marysville Buttes; Sierra Nevada from Modoc Co. to Kern Co. Western Nevada to southern Oregon. May-July.

Geog. note.—Asclepias cordifolia is one of a considerable number of species which inhabit the North Coast Ranges and the entire length of the Sierra Nevada, but are not found in the South Coast Ranges nor in Southern California. It occurs also on the easterly slopes of the Sierra Nevada in western Nevada and in southern Oregon, as do many other species of this distribution category, but it is not found in the outer North Coast Ranges. Stations throughout its range are not infrequent, but the individuals are usually solitary.

Locs.—North Coast Ranges: Humbug, Siskiyou Co., *Butler* 763; Sisson, *Jepson* 14,529; Redding, *Blankinship;* Devils Backbone, n. Humboldt Co., *Jepson;* East Weaver Creek, Trinity Co., *H. S. Yates* 332; Hupa, *Chandler* 1347; South Fork Mt., Trinity Co., *Jepson;* Castle Peak, ne. Mendocino Co., *Jepson* 14,530; Mt. Sanhedrin, *Heller* 5918; Mt. Konocti, *Jepson* 14,531; St. Helena, *Jepson;* Dunns Peak, Vacaville, *Jepson* 14,532. Sierra Nevada: Modoc Co., *M. S. Baker;* Hot Springs Valley, Plumas Co., *Jepson;* Little Chico Creek, *R. M. Austin;* Sierra Valley, *Lemmon;* Cañon Creek, South Fork Yuba River, *L. S. Smith* 1796; Gwin Mine, Calaveras Co., *Jepson;* Italian Bar, South Fork Stanislaus River, *Jepson* 6389; Hetch-Hetchy, *Jepson;* Snow Creek, Yosemite, *Jepson* 10,483; North Fork, Madera Co., *Jepson;* Big Creek sta., Fresno Co., *Jepson;* Kings River Cañon, *Newlon* 227; Burnt Corral Mdw., Little Kern River, *Jepson;* lower Kern River Cañon, near Democrat Sprs., *Peirson* 7312.

Refs.—ASCLEPIAS CORDIFOLIA Jepson, Fl. W. Mid. Cal. 384 (1901), ed. 2, 324 (1911), Man. 774, fig. 761 (1925). *Acerates cordifolia* Benth., Pl. Hartw. 323 (1849), type loc. Marysville Buttes, *Hartweg* 338. *Gomphocarpus cordifolius* Gray, Bot. Cal. 1:477 (1876).

6. ASCLEPIODORA Gray

Stems low and stout. Leaves alternate. Corolla rotate, the ovate lobes greenish, rotate-spreading. Hoods inserted at base of the stamen-column, narrow and elongated, the sides involute-approximate so as to form a sort of tubular process which is incurved at apex and somewhat hooded, the apical cavity bearing a deltoid crest or wing ending in a short acute point; bases of hoods joined to each other by a disk or ring of undulate lobes opposite the glandular slits. Anther wings widest at the middle.—Species 4, North America. (Greek Asklepios, Asclepias, and doron, gift, the gift of the celebrated ancient physician.)

1. **A. decumbens** Gray. Stems decumbent or ascending; herbage green, scabrous-puberulent; leaves elongated, linear-lanceolate, (3 or) 4 to 6 inches long,

short-petioled; corolla 5 lines broad; hoods purplish, overtopping the stamen-column.

Dry slopes, 4000 to 5000 feet: eastern Mohave Desert. East to Arkansas and Texas. June.

Locs.—Fountain Cañon, Providence Mts., *Mary Beal;* Clark Mt., *Munz.*

Refs.—ASCLEPIODORA DECUMBENS Gray, Proc. Am. Acad. 12:66 (1876); Jepson, Man. 775 (1925). *Anantherix decumbens* Nutt., Trans. Am. Phil. Soc. n. ser. 5:202 (1837), type loc. hills near the junction of the Kiamesha and Red rivers, Ark., *Nuttall.*

CONVOLVULACEAE. Morning-glory Family

Ours twining or trailing herbs. Leaves simple, alternate, or the plants leafless parasites. Flowers complete and perfect. Sepals 5, distinct or nearly so, imbricated, persistent, often unequal. Corolla regular, usually showy, usually open-funnelform or more or less campanulate, entire or shallowly 5-lobed, commonly folded longitudinally and twisted in the bud. Stamens 5, borne on the corolla, included (exserted in Cressa). Pistil 1; ovary superior, 2 (rarely 1) -celled, with 2 ovules (rarely 1) in each cell. Styles 1 or 2. Fruit most frequently a capsule, 1 to 4 (or 6) -seeded. Embryo with folded cotyledons; endosperm scanty. The embryo of Cuscuta is filamentous and sometimes destitute of cotyledons.—Species about 1100 in 47 genera, mostly warm regions, all continents.

Bibliog.—Choisy, J. D., De Convolvulaceis dissertatio tertia (Mem. Soc. Phys. et Hist. Nat. Geneva 9:261–288, t. 1–5,—1841). Engelmann, Geo., papers on Cuscutineae in Collected Works, 59–108 (1887). Brandegee, T. S., Convolvulus occidentalis Gray (Zoe 1:85–86,—1890). Greene, E. L., New species of Convolvulus (Pitt. 3:326–333,—1898). House, H. D., A new species of Dichondra (Muhl. 1:130–131,—1906); Synopsis of the Californian species of Convolvulus (Muhl. 4:49–56,—1908). Heller, A. A., New western plants (Muhl. 8:137–142,—1913). Gray, G. P., Spraying for control of Wild Morning Glory, Convolvulus arvensis L., in the fog belt (Cal. Agr. Exp. Sta. Circ. 168:1–7,—1917). Yuncker, T. G., Revision of the N. Am. and West Indian species of Cuscuta (Univ. Ill. Biol. Monog. 6^{2-3}:1–141, pls. 1–13,—1921); The genus Cuscuta (Mem. Torr. Club 18:109–330,—1932). Farwell, O. A., Notes on Volvulus (Am. Midland Nat. 12:129–131,—1930), where many of our species are transferred to Volvulus. Ball, W. S., & Robbins, W. W., Wild Morning-glory (Mo. Bull. Cal. Dept. Agr. 24:192–194, col. pl.—1935).

Ovary deeply 2-lobed; styles 2, distinct or only slightly united at base; corolla-lobes imbricate in the bud; creeping herbs........1. DICHONDRA.
Ovary entire.
  Style 1, entire or cleft at the apex only; corolla plicate and twisted in the bud; prostrate or twining herbs, one species woody.
    Stigma filiform or ovate; corolla-limb pale purple to white........2. CONVOLVULUS.
    Stigma capitate; corolla limb dark blue or rose........3. IPOMOEA.
  Styles 2, distinct; corolla-lobes imbricate in the bud.
    Erect non-twining leafy herb........4. CRESSA.
    Leafless twining parasites........5. CUSCUTA.

1. DICHONDRA Forst.

Perennial herbs (suggesting acaulescent violets). Stems slender, creeping, with reniform leaves and very small obscure solitary flowers at or just below the surface of the ground on short axillary peduncles. Calyx deeply 5-parted. Corolla 5-cleft, the lobes imbricated in the bud. Stamens short. Ovary deeply 2-lobed, separating when ripe into 2 one-seeded utricles which sometimes break open irregularly. Styles 2, in ours united at base or apparently distinct.—Species 4 or 5, temperate and tropical regions, all continents. (Greek, di, double, and chondra, grain, on account of the deeply parted and twin fruit.)

1. **D. repens** Forst. Stems pubescent to tawny hirsute, rooting freely; leaf-blades entire or retuse, green and appressed silky pubescent below, ½ to 1½ inches wide, on petioles about twice their length; calyx in flower shallowly lobed, hairy, but accrescent, and in fruit deeply cleft, glabrate and somewhat thinnish; corolla

white or purplish; ovary densely hairy; peduncles abruptly recurved in fruit, so that the pods are turned down to or into the soil.

Ravines and edges of thickets on open hills, 50 to 1500 feet: widely distributed tropical and subtropical plant, naturalized in central California at scattered localities, especially near the coast. June.

Locs.—Sierra Nevada foothills: Eldorado Co. (betw. Salmon Falls and Pilot Hill and also in New York Ravine), *K. Brandegee*. Coastal: Trinidad, *Tracy* 9785; Trinity River Valley at South Fork, *Tracy* 7764; Mt. Tamalpais (Zoe 2:366); Presidio, San Francisco (Man. Reg. S. F. Bay 266); Mission Hills, San Francisco (Zoe 2:367); Monterey (Zoe 2:366).

Var. **occidentalis** (House) Jepson comb. n. Leaf-blades wholly glabrous or with scattered hairs, especially beneath, 1 to 2 inches wide, the five to seven veins often conspicuous.—Mesa headlands of coastal Southern California where it is possibly native. Also in northern Lower California. April-May.

Locs.—Avalon, Santa Catalina Isl. (Zoe 1:114); Santa Rosa Isl. (Zoe 1:142); Mt. Soledad, *Newlon* 327; La Jolla, *Jepson* 11,854; San Diego, *Geo. B. Grant* 1842.

Refs.—DICHONDRA REPENS Forst., Char. Gen. 40, t. 20 (1776), type loc. "ad insulas maris australis"; Jepson, Fl. W. Mid. Cal. 386 (1901), ed. 2, 325 (1911), Man. 775 (1925). Var. OCCIDENTALIS Jepson. *D. occidentalis* House, Muhl. 1:130 (1906), type loc. San Diego, *Orcutt*.

2. **CONVOLVULUS** L. Bindweed. Morning-glory

Twining or prostrate herbs, ours perennial except one. Corolla funnelform to campanulate. Style entire, or cleft at the apex only. Stigmas ovate to linear. Capsule globose with 4 seeds in 2 cells (or by abortion 1-celled), mostly 2 to 4-valved.—In Convolvulus macrostegius and C. purpuratus the stems are woody below, in our other species, herbaceous.—Species about 200, temperate and tropical regions, all continents. (Latin convolvo, to entwine.)

Flowers showy (¾ or) 1 to 2½ inches long; leaf-blades sagittate (or reniform in no. 1); perennial.
  Calyx subtended by a pair of bracts; bracts large, calycoid, ovate to orbicular, embracing and commonly enclosing the calyx.
    Flowers pink, purple or lavender, 1¾ to 2½ inches long.
      Leaf-blades broadly reniform, ¾ to 2 inches wide; slightly succulent seaside herbs.... 1. *C. soldanella.*
      Leaf-blades long, triangular-sagittate, 2½ to 3½ inches long; minutely puberulent climber with thinnish leaves; swamps or river-bottoms..............2. *C. sepium.*
    Flowers white or cream color (sometimes pinkish outside; sometimes pinkish in no. 5).
      Leaf-blades usually triangular-hastate to ovate-lanceolate; herbage glabrous or nearly so.
        Leaf-blades little longer than wide or as wide as long, broadly triangular; corolla 1½ to 2 inches long; coastal islands..................3. *C. macrostegius.*
        Leaf-blades distinctly longer than wide, almost lanceolate-sagittate; corolla ½ to 1½ inches long; along the S. Cal. coast....................4. *C. occidentalis.*
      Leaf-blades ovoid-deltoid, sagittate to almost truncate at base.
        Herbage glabrous; corolla 1½ inches long; low herbaceous plant; n. Cal........... 5. *C. atriplicifolius.*
        Herbage more or less pubescent.
          Leaves subglabrous or slightly hairy; corolla 1¾ to 2 inches long; low tufted plants, the leaves and peduncles basal; cent. Coast Ranges. 6. *C. subacaulis.*
          Leaves almost felty, covered with a dense villous to almost tomentose pubescence; corolla small, 1 to 1½ inches long.
            Low trailing plant; leaf-blades triangular-deltoid, thick, ½ to 1 inch long; bracts whitish-tomentose; Coast Ranges and Sierra Nevada foothills...7. *C. malacophyllus.*
            Rather wiry climbing plant; leaf-blades orbicular-deltoid, thinnish, 1 to 2 inches long; bracts tawny; Sierra Nevada at middle altitudes...8. *C. chartaceus.*
  Calyx with subulate or reduced bracts more or less distant.
    Bracts sagittate (like the leaves), inserted about ¼ to ½ inch below the calyx; corolla white, 1 to 1½ inches long; slender erect plants, slightly pubescent throughout. 9. *C. fulcratus.*
    Bracts narrowly ovate to lanceolate (without basal lobes as in the leaves).

Bracts inserted less than their length below the calyx.
  Low herbaceous plant; herbage puberulent; leaf-blades ½ to 1 inch long; corolla yellowish, 1 inch long..10. *C. polymorphus.*
  Strong woody climber; herbage glabrous or nearly so; leaf-blades 1 to 2 or 3 inches long; corolla white or usually so, 1 to 2 inches long.................... 11. *C. purpuratus.*
Bracts distant twice or at least more than their length below the calyx; leaf-blades ½ to 2 inches long.
  Stems erect and feebly twining; leaf-blades linear-hastate, less than 3 lines wide; corolla white, 1 inch long...12. *C. longipes.*
  Stems prostrate; leaf-blades elliptic or oblong-sagittate, very obtuse, more than 3 lines wide; corolla white, purplish outside, 8 to 10 lines long.............. 13. *C. arvensis.*
Flowers small, 3 lines long; leaf-blades linear- to oblong-oblanceolate, without basal lobes; annual. 14. *C. simulans.*

1. **C. soldanella** L. BEACH MORNING-GLORY. Stems prostrate, ½ to 1½ feet long from deep-seated rootstocks; herbage glabrous and slightly succulent; leaf-blades thick, decidedly reniform, retuse, mucronulate, deep green and shining, prominently veined, ¾ to 1 or 2½ inches broad, broader than long, the petioles stout, 1 to 3 times as long; calyx enclosed in broad membranous bracts 4 to 8 lines long, and about as broad as long; corolla broadly funnelform, pinkish or pale purple, 1½ to 2½ inches broad and about half as long as broad; capsule 6 to 7 lines long; seeds triquetrous, rounded on outer face, 2 or 3 lines long, very finely puberulent.

Beaches and dunes along the coast: San Diego Co. to Humboldt Co. North to Washington. Widely distributed in the Pacific Islands; also in Europe. Apr.-June.

Locs.—Coronado Beach, San Diego, *Jepson* 1610; Del Mar, *T. Brandegee;* Newport, *Alice King;* Playa del Rey, *Parish* 11,879; Surf, *K. Brandegee;* Pacific Grove, *Chandler* 339; West Berkeley, *Davy* 861; Pt. Arena, *Davy & Blasdale* 6049; Pudding Creek, Fort Bragg, *Jepson* 17,765; Little River, Humboldt Co., *Tracy* 4803.

Refs.—CONVOLVULUS SOLDANELLA L., Sp. Pl. 159 (1753), type European; Jepson, Fl. W. Mid. Cal. 386 (1901), ed. 2, 325 (1911), Man. 776 (1925). *Calystegia soldanella* and *C. reniformis* R. Br., Prod. 484 (1810).

2. **C. sepium** L. HEDGE BINDWEED. Stems from a slender horizontal rootstock, often several feet long, climbing on herbaceous plants or trailing; herbage glabrate, sometimes glaucous; leaf-blades 1½ to 2½ inches long, ovate-lanceolate to strictly lanceolate, acuminate at apex, hastate at base, the basal lobes angled or squarish; petioles slender, shorter than the blade; peduncles often longer than the leaves, 1-flowered; bracts ½ to ¾ inch long, ovate, acuminate at apex, cordate at base, completely enclosing the calyx; corolla pink, 2 to 2½ inches long.

Marshes or river bottoms, 1 to 50 feet: San Francisco Bay region. Naturalized from the eastern United States. June.

Locs.—Suisun Marshes, *Jepson* 14,522; Martinez, *Davy* 6664.

Var. **pubescens** Fer. Herbage soft-puberulent; leaf-blades 2½ to 3½ inches long, sagittate, the basal lobes rounded; corolla pink or whitish.—Swamps and creek bottoms, 10 to 1000 feet: coastal Southern California. East to Florida, thence to Quebec. May-July.

Locs.—San Bernardino, *Parish* 6435; Riverside, *Hall;* Chino, *Condit;* Los Angeles, comm. *E. D. Palmer;* Wintersberg, Orange Co., *Peirson* 7086; Huntington Beach, *Booth* 1359.

Var. **binghamiae** (Greene) Jepson comb. n. Herbage finely puberulent, appearing glabrous; leaves small, 1 to 1½ inches long, oblong-ovate, abruptly acute; bracts oval, 4 lines long, appressed to the calyx, which they only half conceal.—Santa Barbara; a distinct localized variety, rarely collected.

Refs.—CONVOLVULUS SEPIUM L., Sp. Pl. 153 (1753), type European; Jepson, Fl. W. Mid. Cal. 387 (1901), ed. 2, 325 (1911), Man. 776 (1925), in part. *Calystegia sepium* R. Br., Prod. 483 (1810). *Convolvulus limnophilus* Greene, Pitt. 3:329 (1898), type loc. "marshes about northern end of San Francisco Bay." Var. PUBESCENS Fer., Rhod. 10:55 (1908). *Calystegia sepium* var. *pubescens* Gray, Man. ed. 5, 376 (1867). *Convolvulus repens* L., Sp. Pl. 158 (1753), type loc. "in Americae maritimis." *C. sepium* var. *repens* Gray, Syn. Fl. 2:215 (1878). *Calystegia catesbiana* Pursh, Fl. 729 (1814), type loc. "in Carolina, *Catesby.*" *Convolvulus sepium* Jepson, Man.

776 (1925), in part. Var. BINGHAMIAE Jepson. *C. binghamiae* Greene, Bull. Cal. Acad. 2:417 (1887), type loc. "in marshy places about Burton's Mound, in the city of Santa Barbara," *R. F. Bingham.*

3. **C. macrostegius** Greene. ISLAND MORNING-GLORY. Suffrutescent with wiry trailing stems 6 to 15 feet long; herbage glabrous throughout; leaf-blades broadly triangular, hastate, 1 to 2 or 3½ inches long, rather longer than or about equaling the petioles; peduncles 3 to 13 inches long, 1 to 5-flowered, subcymose; buds enclosed in a pair of large membranous mucronate pinkish-tinged bracts ½ to ¾ inch long, the lateral flowers each similarly bracted within the outer bracts; corolla white, fading pinkish in drying, 1½ to 2 inches long.

Hill slopes, 5 to 1500 feet: islands off the coast of Southern and Lower California. Apr.-Aug.

Locs.—S. Cal.: Pelican Bay, Santa Cruz Isl., *Jepson* 12,053; San Clemente Isl., *T. Brandegee;* Santa Barbara Isl., *Abrams & Wiggins* 296; Anacapa Isl., *J. T. Howell* 3800. L. Cal.: Guadalupe Isl., *Franceschi.*

Refs.—CONVOLVULUS MACROSTEGIUS Greene, Bull. Cal. Acad. 1:208 (1885), type loc. Guadalupe Isl., *E. Palmer;* T. Brandegee, Zoe 1:85 (1890). *C. occidentalis* Wats., Proc. Am. Acad. 11:118 (1876), not Gray. *C. occidentalis* var. *macrostegius* Munz, Man. 387 (1935).

4. **C. occidentalis** Gray. CHAPARRAL MORNING-GLORY. Stems freely twining, 1 to 4 feet long; herbage glabrous or nearly so; leaf-blades very variable in shape, ¾ to 1½ inches long, about twice as long as the slender petiole, usually triangular-ovate, acuminate at apex and cordate-sagittate to hastate at base, the basal lobes often 1 or 2-toothed; peduncles elongated, 2 to 3 or 4 inches long, greatly surpassing the leaves, 1 or less commonly 2 or 3-flowered; involucral bracts long-ovate, acuminate, ½ to ¾ inch long; corolla white or cream, pinkish on the outside, ½ to 1½ inches long and about as broad.

Cañon bottoms or clearings in chaparral, 20 to 2000 feet: coastal Southern California. Often climbing over shrubs or brush. Mar.-June.

Locs.—Simi Valley, Ventura Co., *Jepson* 8468; Laurel Cañon, Santa Monica Mts., comm. *E. D. Palmer;* Rubio Cañon, San Gabriel Mts., *Peirson* 151; San Bernardino, *Jepson* 5531; Newport Bay, *Booth* 1081; Santiago Creek, Santa Ana Mts., *Alice King;* Oceanside, *Parish* 4447; San Diego, *Jepson* 6671.

Var. **tenuissimus** Gray. Leaf-blades very narrow, lanceolate-sagittate; peduncles 1 or 2-flowered; bracts 4 to 6 lines long, barely if at all exceeding the calyx; corolla averaging smaller than in the species.—Arid hillsides, coastal Southern California: San Bernardino Valley, *Parish* 11,308; San Jacinto, *Reinhardt;* Temescal Wash, Riverside Co., *Jepson* 1559; Escondido, *C. V. Meyer* 251; Tecate, *Orcutt* 1118; Witch Creek, San Diego Co., *Alderson.*

Var. **cyclostegius** (House) Jepson. Peduncles stout; bracts orbicular, mucronulate, purplish, more or less ciliate at tip.—Coastal form, Monterey Co. to San Diego Co.: Monterey, *Jepson* 14,505; Lime Kiln Creek, Santa Lucia Mts., *Jepson* 1682; Pismo, *Jepson* 8442; Arroyo Grande, *Alice King;* San Miguelito Creek, Lompoc, *Ewan* 7904; Cañada del Capitan, Santa Barbara Co., *Jepson* 11,912; Sycamore Cañon, Santa Inez Mts., *Jepson* 9148; Simi, Ventura Co., *Jepson* 11,902; Del Mar, *Jepson* 1605a.

Refs.—CONVOLVULUS OCCIDENTALIS Gray, Proc. Am. Acad. 11:89 (1876), "western part of Cal., on and near the coast"; Jepson, Man. 776 (1925). *C. aridus* Greene, Pitt. 3:330 (1898), type loc. desert foothills of S. Cal., *Parish.* Var. TENUISSIMUS Gray, Proc. Am. Acad. l.c., type loc. Santa Barbara, *Nuttall;* Jepson, Man. 776 (1925). *C. occidentalis* var. *angustissimus* Gray, Bot. Cal. 1:533 (1876), type loc. Santa Barbara, *Nuttall. C. nuttallii* Greene, l.c. *C. greenei* House, Muhl. 4:54 (1908). Var. CYCLOSTEGIUS Jepson, Man. 776 (1925). *C. cyclostegius* House, Muhl. 4:53 (1908), type loc. Carmel road near Monterey, *Heller* 6827.

5. **C. atriplicifolius** House. OREGON MORNING-GLORY. Low, the stems 4 to 13 inches long, arising from a fleshy slender rhizome; herbage glabrous; leaf-blades broadly triangular-hastate, 1 to 2½ inches long and about as broad, acute at apex and with a hastate lobe diverging at right angles on either side of the cuneately tapering or truncate base; hastate lobes small, mostly entire; flowers few, in the axils of the lower leaves; peduncles ⅞ to 1½ inches long, about equaling the petioles; involucral bracts green, oval, obtuse or almost truncate, about 6 lines long,

slightly exceeding or equaling the obtuse and mucronate sepals; corolla 1½ to 2 inches long, white or pinkish.

Dry hills, 2500 to 3500 feet: Lake Co. and Butte Co., rare. North to Oregon and Washington. June.

Locs.—Lake Co. (Muhl. 4:54); Stirling, Butte Co., *Heller* 10,789. Wash.: Bingen, w. Klickitat Co., *Suksdorf* 2853.

Refs.—Convolvulus atriplicifolius House, Muhl. 4:54 (1908); Jepson, Man. 776 (1925). *Calystegia atriplicifolia* Hallier f., Bull. Herb. Boiss. 5:385, pl. 13, fig. 2 (1897), type from Ore., *Howell*. *Convolvulus nyctagineus* Greene, Pitt. 3:327 (1898), type from Ore., *Howell*.

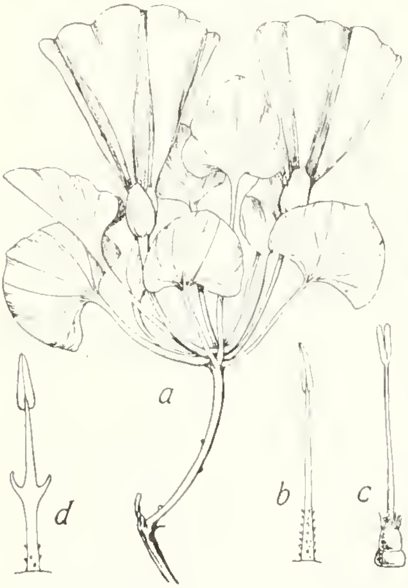

Fig. 361. Convolvulus subacaulis Greene. *a*, habit, × ½; *b*, *d*, stamens, × 1; *c*, pistil, × 1.

6. **C. subacaulis** Greene. Hill Morning-glory. (Fig. 361.) Stems 1 to 15 inches long, when short, erect and crowded, when longer, trailing (frequently almost stemless); leaf-blades ovoid or roundish-deltoid, truncate (or sometimes slightly cuneate or subcordate at base and either with or without divergent hastate lobes at the angles), thin, more or less hairy with somewhat appressed hairs, mostly ¾ to 1½ inches long; petioles elongated, mostly 2 to 3 times as long as the blades; peduncles 1-flowered, ¼ to 1 inch long; bracts ovate, obtuse, ¼ to ½ inch long, embracing but not enclosing the calyx, sparingly or moderately pubescent; calyx glabrous; corolla campanulate-funnelform, angularly 5-lobed, 1½ to 2¼ inches long, white or cream-color with a purplish exterior.

Dry open hills, 100 to 1500 feet: San Luis Obispo Co. to Napa and Solano Cos. Apr.-June.

Locs.—Islai Hill, San Luis Obispo Co., *Summers* 601; Pacific Grove, *Tidestrom;* Greeninger Creek, Santa Cruz Mts., *Jepson* 9700, remarkably villous; Tulare Hill, Santa Clara Co., *Jepson* 12,698; Stanford, *C. F. Baker* 848; Hunter Pt., San Francisco, *Jepson* 12,732; Oakland Hills, *Jepson* 10,395; Benicia Hills, *Jepson* 18,746; Petaluma, *Congdon;* Conn Valley, Napa Range, *Jepson* 14,524; Pigeon Pt., Araquipa Hills, w. Solano Co., *Jepson* 14,827.

Refs.—Convolvulus subacaulis Greene, Man. Reg. S. F. Bay 265 (1894); Jepson, Fl. W. Mid. Cal. 387 (1901), ed. 2, 326 (1911), Man. 777, fig. 762 (1925). *Calystegia subacaulis* H. & A., Bot. Beech. 363 (1840), type from Cal., *Douglas*. *Convolvulus californicus* Choisy; DC., Prod. 9:405 (1845), based on last. Var. dolosus Jepson, Man. 777 (1925), type loc. Berkeley Hills, *Jepson* 9719a; in habit and in flower like the species in every way save that the filaments bear a pair of hook-like teeth near the middle; filaments sparingly glandular short-hairy at base. In Wallich's Numerical List under no. 2256 (1828) occurs the binomial Convolvulus subacaulis Buch-Ham. as a synonym (?) of C. barlerioides Buch-Ham., both nomina nuda.

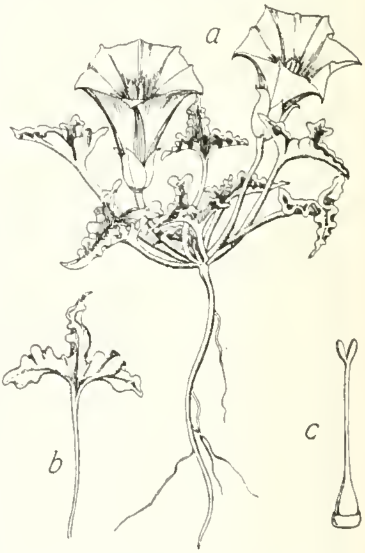

Fig. 362. Convolvulus malacophyllus Greene. *a*, habit, × ½; *b*, leaf, × ½; *c*, pistil, × 1.

7. **C. malacophyllus** Greene. Woolly Morning-glory. (Fig. 362.) Stems ascending or trailing, 3 to 12 inches long, from fleshy but slender rootstocks; herbage with a dense velvety or plushy pubescence; leaf-blades triangular-hastate, ½

to 1 inch long and as broad as long, the basal lobes usually toothed; petioles, except basal ones, usually but not always shorter than the blades; peduncles 1-flowered, short on the trailing branches, long ones at base, often flexuous or curved, especially in age; involucral bracts enclosing the calyx, triangular-ovate, 6 lines long; corolla funnelform, 1 to 1½ inches long, cream-color.

Gravelly soil, open hill and mountain slopes, 1000 to 6500 feet: Coast Ranges from Siskiyou Co. to San Luis Obispo Co.; northern Ventura Co.; Sierra Nevada at somewhat middle altitudes from Shasta Co. to Tulare Co. Apr.-July. It is absent (or at least not reported) from the outer Coast Range.

Locs.—Trailing Coast Range form: Sisson, *Jepson* 14,525; Dorleska, Trinity Co., *Hall* 8670; Mt. Diablo, *Greene;* Jolon, *K. Brandegee;* Paso Robles, *Barber;* Santa Margarita Valley, *Summers* 602. Low tufted inner Coast Range form (*C. collinus* Greene): Indian Valley (mts. e.), ne. Lake Co., *Jepson* 8980; Mt. St. Helena, *Jepson* 10,381; Knoxville, Napa Co., *C. F. Baker* 2968; Howell Mt., Napa Range, *Jepson* 18,841; Fitzsimmon's grade, Sonoma Co., *M. S. Baker;* Mitchell Valley, s. San Benito Co., *Jepson* 12,212. Ventura Co. (tufted form): Seymour Creek, Mt. Pinos, *Peirson* 3555. Sierra Nevada (trailing form): Meadow Valley, Plumas Co., *Jepson* 10,636; Blue Cañon, Placer Co., *H. A. Walker* 1277; Fortman Mt., Mariposa Co., *Congdon;* South Fork Middle Tule River, *Jepson* 4879.

Leaf variation.—Something of habit variation in Convolvulus malacophyllus Greene is indicated by the preceding locality citations. Variation in the size and more particularly the shape of the leaf is very marked and runs to striking extremes. No two collections, scarcely, have quite the same leaf pattern throughout. A common form is the broadly cordate leaf with flowing outline; in other collections or even in the same collection the broadly cordate leaf possesses a lanceolate apex with spreading lateral lobes which are entire or toothed. In this type of leaf, as seen in a series of collections, the body gradually narrows, the lobations become deeper and finally we have the "three-fingered" type as seen in plants from the Santa Lucia Mts., Mt. St. Helena and eastern Mendocino County (the latter being C. tridactylosus Eastw.). Such a series as here described is illustrated in fig. 363. It has no geographic significance as at present understood. The bracts in the form Convolvulus tridactylosus are narrower than is usual in Convolvulus malacophyllus, corresponding, one may say, to the narrower leaves.

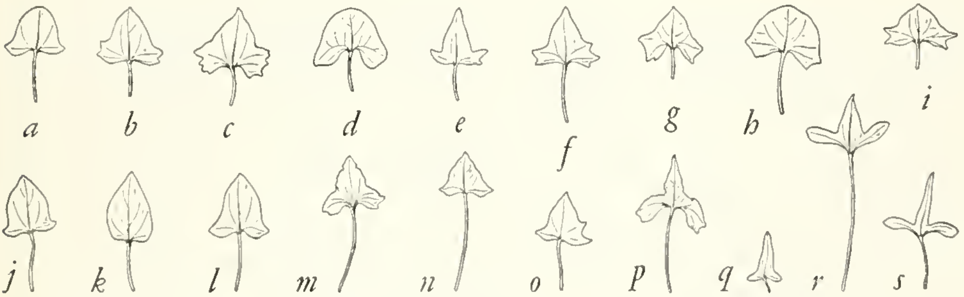

Fig. 363. CONVOLVULUS MALACOPHYLLUS Greene. A series of leaf forms from collections at selected localities throughout the range of the species. *a, b,* × ½ (Seymour Creek, Ventura Co., *Munz* 6964); *c,* × ⅓, and *d,* × ¼ (Dunsmuir, *Hall & Babcock* 4034); *e,* × ⅓, and *f,* × ¼ (s. of Lebec, Ventura Co., *Jones*); *g,* × ¼ (South Fork Middle Tule River, *Jepson* 4879); *h, i,* × ¼ (Meadow Valley, Plumas Co., *Jepson* 10,636); *j,* × ⅓ (Paso Robles, *Barber*); *k,* × ½, and *l,* × ¼ (Bryson, Monterey Co., *Ferris* 8461); *m,* × ⅓ (Mitchell Valley, San Benito Co., *Jepson* 12,212); *n,* × ½, and *o,* × ⅓ (Seymour Creek, Mt. Pinos, *Peirson* 3555); *p,* × ⅓ (Mt. St. Helena, *Jepson* 10,381); *q,* × ⅓ (Santa Lucia Mts., *K. Brandegee*); *r,* × ⅓, and *s,* × ¼ (Covelo, Mendocino Co., *Eastwood* 15,202). These collections in the sum total of their essential features are believed to be alike save in leaf form. Since diverse leaf forms in this group are often found in one collection or even on one individual, or in other cases represent negligible degrees of difference, it is thought that such leaf forms cannot well be used to support segregated specific units.

Var. **pedicellata** Jepson comb. n. Trailing; leaf-blades narrowly lanceolate, acuminate; flowers on pedicels 1 to 2½ inches long.—South coast: Santa Lucia Mts., *K. Brandegee;* Sisquoc, Santa Barbara Co., *M. S. Baker* 12; Santa Paula.

Refs.—CONVOLVULUS MALACOPHYLLUS Greene, Pitt. 3:326 (1898), type loc. "middle Sierra Nevada." *Calystegia villosa* Kell., Proc. Cal. Acad. 5:17 (1873), type loc. Cisco, Placer Co., *Kellogg, Brannan;* not Convolvulus villosus Pers. (1805). *Convolvulus villosus* Gray, Proc. Am.

Acad. 11:90 (1876), based on "C. n. sp.? Torr.," Pac. R. Rep. 4:127 (1857), type loc. Downieville, Yuba River, *Bigelow;* Jepson, Fl. W. Mid. Cal. 387 (1901), ed. 2, 326 (1911), Man. 777, fig. 763 (1925). *C. collinus* Greene, Pitt. 3:326 (1898), type loc. "dry foothills of the Coast Range." *C. tridactylosus* Eastw., Proc. Cal. Acad. ser. 4, 20:151 (1931), type loc. mts. near Covelo, Mendocino Co., *Eastwood* 15,202. *C. tomentellus* Greene, Pitt. 3:327 (1898), type loc. "mts. of S. Cal." Var. PEDICELLATA Jepson. *C. villosus* var. *pedicellata* Jepson, Man. 777 (1925), type loc. Santa Paula, Ventura Co., *Cobb* 138.

8. **C. chartaceus** Jepson. Sierra Morning-glory. Stems coarse, ascending or trailing, rather wiry, 1 to 2 feet long; herbage velvety hairy-pubescent, the hairs on the stems and petioles spreading; leaf-blades large, thinnish, orbicular-deltoid to broadly reniform, obtuse or slightly mucronate at the broad apex, 1 to 2 inches long and as broad or half again as broad, little or not at all lobed at the squarish base; lower petioles elongated, often twice as long as the blades, upper ones usually shorter than the blades; axils of the middle and lower leaves bearing a flexuous or recurved one-flowered peduncle; involucral bracts large, accrescent, papery and conspicuous, tawny or straw-color in age, entirely enclosing the calyx, triangular-ovate to almost orbicular, 6 to 10 lines long and 4 to 6 lines wide; sepals narrowly ovate-acuminate, 3 to 6 lines long; corolla creamy-white to pale yellow, 1 to 1½ inches long, broadly funnelform.

Mountain valleys and flats, 4500 to 6000 feet: from Nevada Co. to Tulare Co. June-July.

Locs.—Bear Valley, Nevada Co., *Jepson* 14,504; Huntington Lake, *A. L. Grant* 1150; Old Colony Mill, *K. Brandegee;* Alta Mdws., *K. Brandegee.*

Refs.—Convolvulus chartaceus Jepson, Man. 777 (1925), type loc. betw. Toll House and Hazel Green, Mariposa Co., *Jepson* 14,503. *C. malacophyllus* Greene, Pitt. 3:326 (1898), type loc. "woods of middle Sierra Nevada," in part.

9. **C. fulcratus** Greene. Sonora Morning-glory. Stems slender, 10 to 18 inches high, not twining except feebly at the sterile leafy summit above the flowers; herbage minutely puberulent to almost villous throughout; leaf-blades ½ to 1 inch long, triangular-sagittate, the moderately divergent lobes often more than half as large as the main blade, the slender petioles ¼ to ¾ inch long; axils of the middle leaves each bearing an elongated filiform 1-flowered peduncle 1½ to 2½ inches long, this with a single pair of sagittate or oblong bracts (like the ordinary leaves but smaller) about ¼ to ½ inch below the calyx; sepals unequal, the inner broader than the outer, truncate, obtuse or mucronate, pubescent; corolla 1 to 1½ inches long, white or cream-color.

Dry grassy slopes, 1400 to 7800 feet: Sierra Nevada foothills from Shasta Co. to Madera Co.; mountains of Southern California. June-July.

Locs.—Fall River Valley, *Baker & Nutting;* Angels Camp, Calaveras Co., *Jepson* 10,430; Mariposa, *Congdon:* Fresno Flats, Madera Co., *Jepson* 12,839; Rock Creek, San Gabriel Mts., *Peirson* 497; Sugarloaf, San Bernardino Mts., *Peirson* 8988; Mesa Grande, San Diego Co., *E. Ferguson* 84.

Var. **deltoideus** Jepson. Leaves short and sharply deltoid, distinctly broader than long, densely soft-pubescent throughout.—Tehachapi Mts. and Mt. Pinos region: Caliente, comm. *E. M. Day;* Keene, *Jepson* 7155; Tehachapi Peak, *Dudley* 346; Griffin, *Elmer* 3804; Cuddy Ranch, *Hall* 6618 (a variable collection). Also in Tuolumne Co.: Harden Ranch, *Jepson* 10,561.

Var. **berryi** Jepson. Plants coarser throughout; leaves large, the blades triangular-sagittate, 1 to 2 inches long, much broader than in the species, as broad as long, densely villous, the basal lobes squarish or often scarcely at all developed.—Sierra Nevada between Kings River and East Fork Kaweah River: Old Colony Mill, *K. Brandegee;* Giant Forest, *K. Brandegee;* Alta Mdws., *K. Brandegee.* The following have smaller leaves, relatively less broad but as densely villous: Old Colony Mill, *K. Brandegee;* upper Marble Fork, Giant Forest, *K. Brandegee;* Marble Fork trail to Round Mdw., *Jepson* 695.

Refs.—Convolvulus fulcratus Greene, Bull. Cal. Acad. 1:208 (1885); Jepson, Man. 778 (1925). *C. luteolus* var. *fulcratus* Gray, Proc. Am. Acad. 11:90 (1876), type loc. Sierra Nevada foothills (Sonora, *Bigelow*). *C. gracilentus* Greene, Pitt. 3:329 (1898), type loc. Mormon Bar, Mariposa Co., *Congdon.* Var. DELTOIDEUS Jepson, Man. 778 (1925). *C. deltoideus* Greene, Pitt. 3:331 (1898), type loc. Tehachapi, Kern Co., *Greene.* Var. BERRYI Jepson, Man. 778 (1925). *C. berryi* Eastw., Proc. Cal. Acad. ser. 3, 2:287 (1902), type loc. Millwood, Fresno Co., *Eastwood.*

10. **C. polymorphus** Greene. Modoc Morning-glory. Stems slender, erect or trailing, 1 to 2 feet long, sometimes feebly twining from the sterile leafy tips; herbage pale and puberulent throughout; leaf-blades reniform-hastate to narrowly subsagittate, mucronate, ½ to 1 (or 1½) inches long; axils of the middle leaves bearing short peduncles; peduncles 1-flowered, equaling or somewhat exceeding the leaves; calyx subtended by a pair of narrowly elliptic to lanceolate green bracts at a short distance below it, their tips enclosing the bases of the sepals; sepals very unequal, the inner often broadly ovate and obtuse; corolla white, 1 to 1¼ inches long.

Bushy or wooded slopes, 2500 to 6000 feet: northern Sierra Nevada from Nevada Co. to Modoc Co.; North Coast Ranges from Lake Co. to Siskiyou Co. North to southern Oregon. May-July.

Locs.—Sierra Nevada: Summit Soda Sprs., *Kennedy & Doten;* Jonesville, Butte Co., *Copeland* 674; Mineral, e. Tehama Co., *J. Grinnell;* Fall River Valley, Shasta Co., *Baker & Nutting;* Fort Bidwell, *Manning* 40. North Coast Ranges: Kelseyville, Lake Co., *Jepson* 14,520; Longvale, Mendocino Co., *Tracy* 6235; Bull Creek, Humboldt Co., *Jepson* 16,700; Little Hors-Linto Creek, Trinity Summit, *Tracy* 15,531; Rosewood, w. Tehama Co., *Jepson* 14,521; Van Duzen River, *Tracy* 3974; Yreka, *Butler* 764. The foregoing material indicates that this species should, possibly, be regarded as no more than a variety of Convolvulus purpuratus.

Refs.—Convolvulus polymorphus Greene, Pitt. 3:331 (1898), n. Cal. and s. Ore.; Jepson, Man. 778 (1925).

11. **C. purpuratus** Greene. Stem woody below, climbing over shrubs and trees, 4 to 8 feet high; herbage glabrous; leaf-blades 1 to 2½ inches long, triangular-lanceolate to narrowly lanceolate, acute or acuminate, sagittate at base, the basal lobes quadratish, angularly lobed; bracts slender; corolla purple, 1½ to 1¾ inches long, its limb 1½ to 1¾ inches broad.

Dry brushy slopes, 10 to 1000 feet: islands in San Francisco Bay and adjacent mainland in San Francisco and Marin counties. Apr.

Locs.—Sheep Isl., *Tidestrom;* Angel Isl.; Tiburon; Presidio, *Tidestrom.* The corolla in the species is longer, the limb wider and the throat broader than is usual in the varieties. There are, however, intergrades with the widely spread white-flowered varietal forms.

Tax. note.—The Convolvulus of stream banks and cañon sides in the Coast Ranges and northern Sierra Nevada foothills, with perennial climbing main stems and white flowers, described below as C. purpuratus var. fruticetorum, is a fairly common and widely distributed morning-glory, having a longitudinal range of four hundred miles. It has been known as Convolvulus luteolus Gray (1876) for sixty years. Under the International Rules of Nomenclature, as amended in 1930, the name Convolvulus luteolus is no longer a legal name, since it is a later homonym, there being in existence a prior Convolvulus luteolus Sprengel of the year 1825. The next available name in the group is Convolvulus purpuratus Greene (1898), the type of which is not the usual white-flowered form but the purple-flowered variety, Convolvulus luteolus var. purpuratus Greene (1894), a narrow varietal endemic limited to a few square miles on the islands of San Francisco Bay and the adjacent counties of San Francisco and Marin. Therefore, under the rules this purple-flowered form takes on specific rank and is to be known as Convolvulus purpuratus Greene, while the white-flowered form, formerly of specific rank, now becomes the variety and is to be known as var. fruticetorum House, the oldest name in the varietal category for this form. These findings are in accordance with the International Rules, but the result nomenclatorially is not pleasing. The decisions are not in harmony with a philosophical view of these plants from the standpoint of biology and plant geography. It is much more rational to look upon the abundant widely distributed white-flowered form as the species with a species name, and to consider the purple-flowered rare variant as a variety with a varietal name. Nevertheless, the rules are followed and we describe the varieties as follows:

Var. **fruticetorum** House. Brush Morning-glory. (Fig. 364.) Stems woody below, 2 or 5 to 20 feet high, climbing over trees and shrubs and cord-like in age; herbage glabrous and glaucous, or rarely with the leaves minutely puberulent beneath; leaf-blades 1 to 2 or 3 inches long, sagittate at base, the upper portion or terminal lobe varying from triangular to narrowly lanceolate; basal lobes large, very variable (sometimes nearly as large as the terminal lobe), angular with v-shaped basal sinus, or squarish with the basal sinus narrowly linear or quite closed, shallowly 2-lobed, or somewhat saliently and acutely lobed; petioles usually about the length of the blades; axils of the middle leaves bearing the peduncles, these filiform, 1 to 2 or 5 inches long, commonly 1 to 3 (or sometimes 5)-flowered; bracts subulate, lanceolate or oblong, acute, 2 to 5 lines long, distant their length to ½ their length from the calyx; sepals obtuse, unequal, firm, coriaceous, the two outer ones short; corolla open-funnelform, creamy white or white, exposed portion of the folds brown or purplish, 1 to 1½ (or 2) inches long; limb not lobed, scarcely angular.—Along wooded streams or on brushy slopes, 10 to 3500 feet: Coast Ranges from Monterey Co. to Humboldt Co.; Marysville Buttes; Sierra Nevada foothills from Amador Co. to Shasta Co. Apr.-July.

Locs.—Form *a* (typical *C. fruticetorum* Greene), of the inner North Coast Ranges; leaves often microscopically puberulent; leaf-blades sometimes extremely large, broad-triangular, sagittate, with u-shaped basal sinus; bracts usually larger than in the species, C. purpuratus, or in forms *b* and *c:* Dutton Cañon, Vaca Mts., *Jepson* 14,506; Blue Lakes, Lake Co., *Jepson* 14,507; Willow Creek, Humboldt Co., *Tracy* 3342; Middle Creek, Shasta Co., *Heller* 7955. Form *b*, of the Coast Ranges and Sierra Nevada, the traditional C. luteolus Gray; leaf-blades triangular-sagittate; bracts small.—Coast Ranges: San Miguel Cañon, Santa Lucia Mts., *Plaskett;* Santa Cruz, *Jones* 2246; Coyote Creek, Santa Clara Co., *Jepson* 14,516; Morrison Cañon, Niles, *Jepson* 14,514; North Berkeley Hills, *Jepson* 9720; Mt. Tamalpais, *Jepson* 14,511; St. Helena (range w.), *Jepson* 14,517; Calistoga, e. of, on Pope Valley grade, *Jepson* 14,518; Pleasant Valley, Solano Co., *Jepson* 14,513; Ten-mile Creek, Mendocino coast, *Jepson* 17,846; Upper Mattole, Humboldt Co., *Tracy* 8298; Kneeland Prairie, Humboldt Co., *Tracy* 3859. Marysville Buttes: North Butte, *Ewan* 9605. Sierra Nevada foothills: Amador Co., *Hansen;* Auburn, *Shockley;* Kress, Nevada Co., *Hall* 10,192. Form *c*, of Marin Co., leaves narrow-lanceolate with sagittate base: Tiburon, *Jepson* 12,916; Mt. Tamalpais, *Jepson* 14,510.

Var. **saxicola** (Eastw.) Jepson comb. n. Leaf-blades cordate-orbicular; bracts reduced, alternate, subulate; pedicels usually short (mostly 3 to 6 lines long).—Sonoma Co.: Bodega Head, *K. Brandegee;* Bodega cliffs, *K. Brandegee* (pedicels 9 to 12 lines long).

Refs.—CONVOLVULUS PURPURATUS Greene, Pitt. 3:332 (1898). *C. luteolus* var. *purpuratus* Greene, Man. Reg. S. F. Bay 265 (1894), based on spms. from the islands of San Francisco Bay and mainland of Marin Co.; Jepson, Man. 779 (1925). Var. FRUTICETORUM House, Muhl. 4:55 (1908). *C. fruticetorum* Greene, Pitt. 3:333 (1898), type loc. inner Coast Range. *C. luteolus* Gray, Proc. Am. Acad. 11:90 (1876); Jepson, Fl. W. Mid. Cal. 387 (1901), ed. 2, 326 (1911), Man. 778, fig. 764 (1925); not C. luteolus Spr. (1825). *Ipomoea sagittaefolia* H. & A., Bot. Beech. 151 (1833), type from Cal., *Douglas;* not Convolvulus sagittaefolius Salisbury (1796). *C. luteolus* var. *solanensis* Jepson, Fl. W. Mid. Cal. 388 (1901), type loc. Gates Cañon, Vaca Mts., *Jepson* 14,509. *C. purpuratus* var. *solanensis* House, Muhl. 4:55 (1908). *C. illecebrosus* House, Muhl. 4:54 (1908), type loc. Mt. Tamalpais, *Rydberg* 6228. Var. SAXICOLA Jepson. *C. saxicola* Eastw., Bull. Torr. Club 30:495 (1903), type loc. Bodega Pt., Sonoma Co., *Eastwood.* *C. luteolus* var. *saxicola* Jepson, Man. 779 (1925).

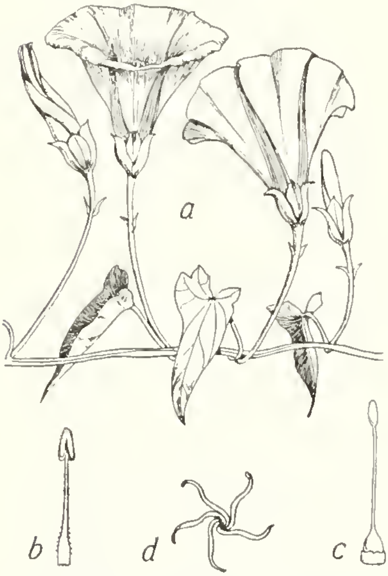

Fig. 364. CONVOLVULUS PURPURATUS var. FRUTICETORUM House. a, sect. of fl. stem, × ½; b, stamen, × 1; c, pistil, × 1; d, diagrammatic cross sect. of corolla in the bud, × 1½.

12. **C. longipes** Wats. PIUTE MORNING-GLORY. Stems erect, much branched, feebly twining, 1 to 3 feet high; herbage glabrous throughout; leaf-blades small, linear-hastate, ½ to 1½ inches long and 1 to 3 lines wide; short-petiolate lower leaves with well developed hastate lobes; upper leaves gradually reduced to linear bracts, these occurring generally as alternate bracts on the peduncle about ¼ to 1 inch below the flower; peduncles elongated, mostly 1-flowered; sepals ovate, obtuse, often mucronate, the outer two shorter, giving the appearance of bracts; corolla 1 inch long, broadly funnelform, white, cream-color or yellow.

Arid or desert slopes, 2000 to 4500 feet: Southern California from San Diego Co. to Los Angeles Co.; San Luis Obispo Co.; Tehachapi Mts.; southern Sierra Nevada in Kern Co. East to Nevada. June-July.

Locs.—Laguna Mts., San Diego Co., *T. Brandegee;* Campo, San Diego Co., *T. Brandegee;* Mt. Gleason, San Gabriel Mts., *Elmer* 3603; San Luis Obispo Co., *Palmer* 416; Tehachapi Mts., *Hasse & Davidson* 1712; Piute Peak, *Purpus* 5012.

Refs.—CONVOLVULUS LONGIPES Wats., Am. Nat. 7:302 (1873), type loc. s. Nev., *Wheeler;* Jepson, Man. 779 (1925).

13. **C. arvensis** L. Orchard Morning-glory. Field Bindweed. Stems prostrate, 1 to 3 or many feet long, from perennial roots which descend to great depth; herbage minutely villous-pubescent or almost glabrous; leaf-blades elliptic to oblong-sagittate, very obtuse or even retuse, less commonly acutish, ½ to 1 (or sometimes 2) inches long, on petioles half as long or the upper blades short-petiolate; peduncles 1 to 2 inches long, commonly 1 (sometimes 2 or 3)-flowered, with a pair of subulate or narrowly spatulate bracts (1 to 2 lines long) near the middle; calyx cupulate; sepals oblong, obtuse, 2 to 3 lines long, hyaline-margined, somewhat gibbous; corolla white, purplish outside, open-funnelform and neither lobed nor angled, (8 or) 9 to 10 lines long.

Naturalized weed, native of Europe, in fields, roadsides and waste places, 10 to 5000 feet: common throughout cismontane California, especially towards the interior, rare in transmontane territory. A difficult weed to eradicate, the most troublesome orchard and garden pest yet naturalized in California. In alluvial valley soils its roots go down 18 feet or more. May-Oct.

Locs.—San Mateo River, San Diego Co., *Wiggins* 3008; San Bernardino, *Parish* in 1890; Los Angeles, *Davidson* in 1895; Santa Cruz Isl. (Bull. Cal. Acad. 2:408); Bakersfield, *Davy* 1776 in 1896; Stockton, *Fitch* 149 in 1888; Berkeley, *Jepson* 14,500 in 1897; Mt. Eden, *K. Brandegee* in 1905; Howell Mt. foothills, *Jepson* 14,502 in 1893; Suisun Marshes, *Jepson* 14,501 in 1892; Vacaville, *Jepson* in 1886; Boca, Nevada Co., *Sonne* in 1888; Mt. Shasta, *Geo. B. Grant* 5219 in 1902; Fort Bidwell, Modoc Co., *Manning* 44 in 1903; between Bluff Creek and Orleans Bar, Klamath River, *Chandler* 1463 in 1901; Martins Ranch, mouth South Fork Trinity River, *Jepson* in 1902.

Refs.—Convolvulus arvensis L., Sp. Pl. 153 (1753), type European; Jepson, Fl. W. Mid. Cal. 388 (1901), ed. 2, 326 (1911), Man. 779, fig. 765 (1925); Parish, Bull. S. Cal. Acad. 19^4:23 (1920).

14. **C. simulans** L. M. Perry. Mesa Morning-glory. Diffusely branching annual, the branches 6 to 18 inches long; herbage minutely puberulent to hairy; leaf-blades linear- or oblong-oblanceolate, obtuse at apex, narrowed below to a short petiole, ¾ to 1½ (or 3½) inches long; peduncles shorter than the leaves, ¼ to ¾ inch long, 1-flowered, with a pair of small spatulate or subulate bracts 1 to 2 lines below the flower, retrocurved in fruit; sepals of two kinds, the two outer lanceolate, greenish, hairy, the inner ovate with scarious margin; corolla purplish, 3 lines long, deeply 5-cleft.

Valleys, grassy mesas and coastal hills, 10 to 1000 feet: lower San Joaquin Valley and the South Coast Ranges to coastal Southern California. South to northern Lower California. The quite even distribution, as shown by regular collections at intervals and in rather unpopulated areas, would argue for this plant being native rather than an introduced element as formerly considered. Apr.-May.

Locs.—Antioch, *K. Brandegee;* lower San Joaquin River, San Joaquin Co., *Bioletti:* Estrella, San Luis Obispo Co., *Jared;* Cholame, San Luis Obispo Co., *Lemmon;* San Pedro, *Davidson* 2964; Sweetwater, San Diego Co., *Cleveland;* San Diego, *Orcutt.* L. Cal.: Las Palmas, *T. Brandegee.*

Refs.—Convolvulus simulans L. M. Perry, Rhod. 33:76 (1931), type from L. Cal., *Pringle. Breweria minima* Gray, Proc. Am. Acad. 17:228 (1882); but not C. minimus Aubl. (1775). *C. pentapetaloides* Jepson, Fl. W. Mid. Cal. 388 (1901), ed. 2, 326 (1911), Man. 779 (1925); Parish, Bull. S. Cal. Acad. 19^4:23 (1920); not L.

3. **IPOMOEA** L. Morning-glory

Ours twining or trailing annuals similar to Convolvulus. Calyx not subtended by bracts but the outer sepals commonly larger. Flowers in ours blue or rose in part. Style entire; stigma capitate.—Species 300, warm regions, all continents. (Greek ip, bindweed, says Linnaeus, and omoios, similar.)

Sepals attenuate and caudate, abruptly narrowed upwards to a linear, spreading "tail" in fruit; leaves commonly divided into three nearly equal lobes..................................1. *I. hederacea.*
Sepals ovate or lanceolate, simply acute, uniformly enlarged in fruit; leaves usually undivided...... 2. *I. purpurea.*

1. **I. hederacea** Jacq. Ivy Morning-glory. Herbage pubescent to hirsute; leaf-blades 1 to 3 inches broad, divided into 3 ovate-acuminate lobes; flowers usually

solitary, short-pedicellate, in axils of uppermost leaves; sepals hirsute or almost pilose below, with often recurved herbaceous and spreading tips, increasingly prominent in fruit; corolla-tube usually white, the limb light blue, purple or rose; capsule 6 lines long.

A garden annual from Mexico, sparingly escaped, 5 to 2000 feet: coastal Southern California. Sept.-Jan.

Locs.—Arlington, Riverside Co., *Gordon Surr;* Santa Catalina Isl. (Field Mus. Nat. Hist. Bot. 5:201).

Refs.—IPOMOEA HEDERACEA Jacq., Coll. 1:124 (1786), "in America torrida"; Edwards, Bot. Reg. t. 85 (1815). *Convolvulus nil* L.; Curtis, Bot. Mag. t. 188 (1793). *I. nil* Roth and *I. scabra* Forsk., acc. House; Bailey, Cyclop. Hort. 2:1659 (1930). *I. hirsutula* Jepson, Man. 779 (1925), in part.

2. **I. purpurea** Roth. COMMON MORNING-GLORY. Herbage usually sparingly pubescent; leaf-blades cordate, abruptly acute, 1 to 3 inches broad, undivided; flowers in clusters of 2 or 3 on peduncles 1 to 4 inches long, axillary, well distributed along the stem; sepals sparingly hirsute, gradually narrowed upwards to an acute tip, little enlarged in fruit; corolla as in last; capsule globose, 3 to 4 lines long.

Native of Mexico, an occasional garden escape, 5 to 1000 feet: a few scattered localities, chiefly about the larger cities. Aug.-Sept.

Locs.—Suisun, *H. A. Walker* 984; Los Angeles (Zoe 1:56); San Diego Co. (Syn. Fl. 2:210).

Refs.—IPOMOEA PURPUREA Roth, Bot. Abh. 27 (1787); Dav. & Mox., Fl. S. Cal. 283 (1923). *Convolvulus purpureus* L., Sp. Pl. ed. 2, 219 (1762), "habitat in America." *I. hirsutula* Jepson, Man. 779 (1925), in part.

4. **CRESSA** L.

Low canescent perennial herb with erect or diffuse non-twining stems. Corolla white, its tube oblong-campanulate, equaling the sepals; limb 5-parted. Filaments subulate, exserted from the throat of the corolla. Ovary 2-celled, 4-ovuled. Styles 2, distinct; stigmas capitate. Capsule by abortion often 1-seeded.—Species 1, all continents. (Greek Kressa, a Cretan woman.)

1. **C. cretica** L. var. **truxillensis** Choisy. ALKALI WEED. Commonly densely branched from the base, forming low silvery tufts 3 to 10 inches high; leaf-blades oblong-ovate, 2 to 4 or 7 lines long, almost sessile; flowers short-pediceled in the axils; sepals oblong-ovate, acute, 2 lines long; corolla 3 lines long, its lobes oblong-ovate, about 1 line long, hairy outside or even comose; summit of ovary long-hairy.

Alkaline valleys and deserts and coastal marshes, 10 to 100 (or 5000) feet: throughout California. West coasts of North and South America. Apr.-Sept.

Tax. note.—The variety truxillensis with its pedicellate flowers, spicately distributed at ends of branchlets, and its oval leaves, sessile by a narrow base, is amply contrasted with the typical plant of the Mediterranean region, whose sessile flowers are capitately congested at the ends of the branchlets, and whose ovate leaves (averaging about 2 lines long and very numerous) are sessile by a broad base. Our plant is very abundant on plains of the San Joaquin Valley, often covering thousands of acres. Sometimes broad areas of it do not flower or only rarely. By ranchers, especially where it is a pest in orchards, it is sometimes called White Weed.

Locs.—Honey Lake Valley, Lassen Co., *Davy* 3395; Vacaville, Solano Co., *Jepson* 14,499; Bolsa near Hollister, *Jepson;* Palo Prieto Pass, se. San Luis Obispo Co., *Jepson* 15,887; San Miguel Isl. (Pitt. 1:80); Oxnard, Ventura Co., *Condit;* Santa Catalina Isl. (Zoe 1:142); Long Beach, *Parish;* Newport Bay, *Booth* 1052; Coronado, San Diego Co., *M. F. Spencer;* Colorado River opp. Cibola, *J. Grinnell.*

Refs.—CRESSA CRETICA L., Sp. Pl. 223 (1753), type loc. Crete. Var. TRUXILLENSIS Choisy; DC., Prod. 9:440 (1845). *C. truxillensis* H.B.K., Nov. Gen. & Sp. 3:119 (1818), type loc. Truxillo, Peru. *C. cretica* Jepson, Fl. W. Mid. Cal. 388 (1901), ed. 2, 327 (1911), Man. 780 (1925). *C. vallicola* Hel., Muhl. 8:140, pl. 17 (1913), type loc. San Jose, *Heller* 8936a.

5. **CUSCUTA** L. DODDER

Annual leafless parasites, essentially destitute of green color. Stems twining, filiform, white to golden yellow. Flowers small, usually abundant, in lateral heads or clusters. Calyx colored like the corolla, deeply 5-cleft. Corolla campanulate or somewhat urnshaped to short-tubular, with 5 lobes imbricated in the bud, and as many small scales or appendages inserted in the tube below the stamens, or none. Ovary globular, 2-celled, 4-ovuled. Styles 2, in ours distinct, persistent; stigmas globose, sometimes linear-elongated. Capsule 1 to 4-seeded, ours indehiscent. Embryo devoid of cotyledons.—Species 158, all continents. (Derivation doubtful.)

Biol. note.—The germinating seed produces a twining stem; this becomes parasitic by means of suckers which penetrate the bark of the first available host. Lacking such a host the seedling dies. In cases of membranous yet fleshy flowers the calyx may become so strongly adpressed against the corolla-tube as to appear wanting in dried material.

- Capsule pointed or conical or at least thickened at summit; scales present.
  - Corolla-scales dentate; flowers less than 1 line long; stems very fine or capillary; dry desert areas..1. *C. denticulata.*
  - Corolla-scales deeply to moderately fringed; flowers 1 to 2 (or 3) lines long; stems usually coarse, sometimes slender.
    - Scales narrow, oblong, shorter than the corolla-tube.
      - Corolla-tube cylindric; calyx-lobes about ½ as long as the corolla-tube; flowers 2½ to 3 lines long; thickets, mostly in the hills, common............2. *C. subinclusa.*
      - Corolla-tube shallow-campanulate; calyx-lobes about as long as the corolla-tube; flowers 1 to 1½ lines long; salt marshes, abundant......................3. *C. salina.*
    - Scales ovate or oblong-ovate, as long as the corolla-tube; flowers 1 to 2 lines long; alfalfa fields.
      - Corolla-tube broadly campanulate; calyx-lobes ½ to as long as the corolla-tube; flowers 1 to 2 lines long..4. *C. indecora.*
      - Corolla-tube narrow-campanulate; calyx-lobes usually less than ½ as long as corolla-tube; flowers 1½ to 2 lines long..5. *C. suaveolens.*
- Capsule depressed-globose, with a conspicuous central pit.
  - Scales present; flowers usually less than 1 line long, merely enclosing the base of the conspicuous globose capsule.
    - Scales large, deeply fringed; moist places..6. *C. arvensis.*
    - Scales small, represented by 2 dentate wings; dry montane slopes or flats..7. *C. suksdorfii.*
  - Scales absent; flowers showy, usually 1½ to 2 lines long (except in var.) and enclosing the mature capsule; dry sandy ridges..8. *C. californica.*

1. **C. denticulata** Engelm. DESERT DODDER. Stems hair-like; flowers small, ¾ to 1¼ lines long, short-pediceled in small umbel-like clusters; corolla short-campanulate (urnshaped in fruit), its tube included in the rounded denticulate lobes of the calyx; anthers oval, on very short filaments; scales narrow, reaching to the base of the stamens, denticulate at the rounded tip and less so below; capsule pointed, covered by the withered corolla, 1 or 2-seeded.

Arid regions, 450 to 3000 feet: western Colorado Desert; Mohave Desert and its bordering ranges; Inyo Co. East to Utah. May-July.

Locs.—Myers Creek bridge, foot of Mountain Sprs. grade, sw. Imperial Co., *Jepson* 11,766; Ravenna, Los Angeles Co., *K. Brandegee;* Cushenbury Sprs., San Bernardino Mts. (Zoe 4:165); Barstow, *K. Brandegee;* Needles, *Jones* 3862; Darwin, Inyo Co., *Ferris* 7906.

Refs.—CUSCUTA DENTICULATA Engelm., Am. Nat. 9:348 (1875), type loc. St. George, Utah, *Parry* 205; Jepson, Man. 780 (1925); Yuncker, Mem. Torr. Club 18:171 (1932).

2. **C. subinclusa** D. & H. CAÑON DODDER. Stems commonly stout; flowers 2½ to 3 lines long, sessile or short-pediceled, at length in large dense clusters ½ to 1½ inches thick; calyx-lobes overlapping, ovate-lanceolate, about ½ the length of the corolla-tube; corolla-tube cylindrical, 1½ to 2½ lines long; lobes of the corolla ovate-lanceolate, minutely crenulate, scarcely more than ½ the length of the tube; anthers oblong or oval, sessile or nearly so; scales narrow, fimbriate, opposite the stamens but reaching only to the middle of the tube; styles slender, mostly longer than the ovary; ovary capped by the withered corolla.

Common on a wide range of shrubs and herbaceous plants, favoring river and creek bottoms, cañons and mountain meadows, sometimes invading orchards, 50 to 5500 feet: almost throughout California. July-Sept.

Locs.—S. Cal.: Ramona, San Diego Co., *T. Brandegee* (on Rhus laurina); Highland, San Bernardino Valley, *McCoy* (on Citrus); Rubio Cañon, San Gabriel Mts., *Peirson* 150 (on Rhus laurina); Redondo Beach; Santa Ana River near Newport Beach, *Booth* 1316; Santa Cruz Isl.

(Bull. Cal. Acad. 2:408); Ojai Valley, *Thacher* 34 (on Rhus laurina). Coast Ranges: Niles, *Jepson* 125b (on Centaurea melitensis); Black Mt., Santa Clara Co., *C. F. Baker* 57 (on Sambucus); Mt. Tamalpais, *Jepson* 14,834 (on Photinia arbutifolia); Howell Mt., *Jepson* 1735 (on Cercocarpus betuloides); Alamo Creek, ne. Solano Co., *Jepson* 4e (on Artemisia heterophylla); Gates Cañon, Vaca Mts., *Jepson* 4a (on Photinia arbutifolia); Brannan Mt., Humboldt Co., *Tracy* 6736 (on Ceanothus integerrimus). Sierra Nevada: Old Colony Mill, Tulare Co., *K. Brandegee* (on Convolvulus); Owens Valley, *Horn* 2849 (on Salix); Huntington Lake, Fresno Co., *A. L. Grant* 1141 (on Artemisia heterophylla); Wawona, *Jepson* 5650 (on Chamaebatia foliolosa); Calaveras Big Trees, *Jepson* 10,079 (on Chamaebatia foliolosa); Lassen Peak, *R. M. Austin* 492 (on Salix); Joseph Creek, Modoc Co., *Manning* 498 (on Rosa).

Refs.—Cuscuta subinclusa D. & H., Jour. Acad. Nat. Sci. Phila. ser. 2, 3:42 (1855), type loc. Tejon Pass, *Heermann;* Jepson, Fl. W. Mid. Cal. 389 (1901), ed. 2, 327 (1911), Man. 780 (1925).

3. **C. salina** Engelm. Marsh Dodder. (Fig. 365.) Stems slender; flowers 1 to 1½ lines long; calyx-lobes ovate-lanceolate, as long as the shallow-campanulate tube of the corolla and as the corolla-lobes; these ovate, microscopically or obscurely denticulate; filaments about as long as the oval anthers; scales fringed, mostly shorter than the tube, sometimes much reduced and on the base of the tube; styles longer or shorter than the ovary; capsule surrounded by the withered corolla, mostly 1-seeded.

Salt marshes or moist saline flats, 1 to 1000 feet: Southern California; north mostly along the coast to Humboldt Co. Far north to British Columbia, east to Arizona and Utah. Very abundant on Salicornia and other saline herbs, entangling them with its webs of thread-like stems, which in spring color the salt marshes as if with small patches of gold. July-Oct.

Locs.—San Diego, *T. Brandegee;* Temescal Wash, Riverside Co., *Jepson* 1570; Newport, Orange Co., *Booth* 1096; Pt. Mugu, Ventura Co., *J. T. Howell* 3132; Bakersfield, *Davy* 1966; Benicia, *Jepson* 5a. Larger flowered (1½ to 2½ lines) maritime form (var. major Yuncker): San Diego, *Berg;* Ballona Marshes, Los Angeles Co., *Chandler* 2043; West Berkeley, *Davy;* Humboldt Bay, *Tracy* 1256.

Refs.—Cuscuta salina Engelm.; Gray, Bot. Cal. 1:536 (1876), type loc. saline marshes, San Francisco Bay, *C. Wright, Bolander, Kellogg:* Jepson, Fl. W. Mid. Cal. 389 (1901), ed. 2, 327 (1911), Man. 780 (1925). *C. subinclusa* var. *abbreviata* Engelm., Trans. St. Louis Acad. 1:500 (1859), type loc. Mare Isl., *Wright. C. californica* var. *squamigera* Engelm., Trans. St. Louis Acad. 1:499 (1859), type loc. Rio Virgen, Utah, *Remy. C. subinclusa* var. *squamigera* Yuncker, Univ. Ill. Biol. Monog. 6:161 (1921). *C. squamigera* Piper, Contrib. U. S. Nat. Herb. 11:455 (1906). *C. salina* var. *major* Yuncker, Univ. Ill. Biol. Monog. 6:161 (1921), type loc. Palo Alto, *C. F. Baker* 41.

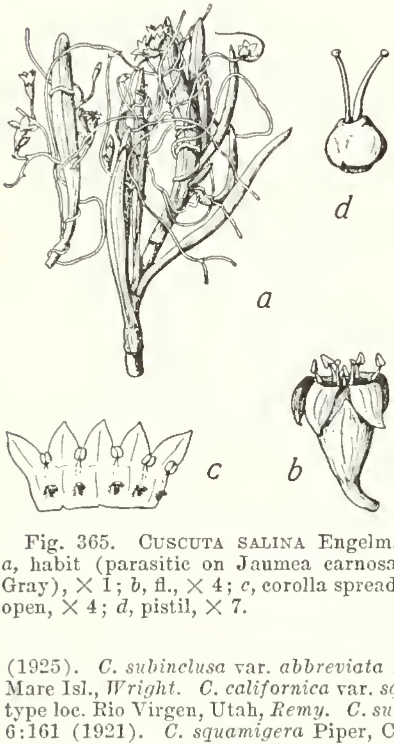

Fig. 365. Cuscuta salina Engelm. *a,* habit (parasitic on Jaumea carnosa Gray), × 1; *b,* fl., × 4; *c,* corolla spread open, × 4; *d,* pistil, × 7.

4. **C. indecora** Choisy var. **neuropetala** Hitchc. Lucern Dodder. Stems rather stout, often turning dark in age; flowers 1 to 2 lines long, pediceled in loose cymes, more or less papillose; calyx-lobes ovate-lanceolate, acute, mostly shorter than the broadly campanulate (little longer than broad) corolla-tube; corolla-lobes triangular, minutely crenulate, spreading, about as long as the tube, their tips inflexed; scales ovate, erect, deeply fringed; stamens slightly exserted, anthers and stigma often purple; capsule subglobose, thickened at summit, enveloped by the withering corolla; seeds 2 to 4.

Jepson, Flora of California, vol. 3, pt. 1, pp. 17–128, May 31, 1939.

On legumes and composites, apparently spreading in seed of Medicago sativa, –10 to 2700 feet: scattered localities throughout the state. July-Sept.

Locs.—Holtville, Imperial Co., *Parish* 8080; Lost Lake, Lone Pine Cañon, San Gabriel Mts., *Wheeler* 2146; Fresno, *K. Brandegee;* Livermore, *Hooper* 5016; Butts Cañon, Napa Co., *Jepson* 15,703; Clear Lake, *Bolander* 2; Chico, *Heller* 11,677; Yollo Bolly Mts., Tehama Co., *T. Brandegee;* Hy-am-pum, Trinity Co., *Chesnut & Drew.*

Refs.—CUSCUTA INDECORA Choisy, Mem. Soc. Phys. et Hist. Nat. Geneva 9:278, t. 3, fig. 3 (1841), type loc. Matamoras, Mex., *Berlandier* 2285. Var. NEUROPETALA Hitchcock, Contrib. U. S. Nat. Herb. 3:549 (1896). *C. neuropetala* Engelm., Am. Jour. Sci. & Arts 45:75 (1843), type loc. Houston, Tex., *Lindheimer* 124. *C. indecora* Jepson, Man. 781 (1925).

5. **C. suaveolens** Ser. FRINGE DODDER. Stems slender, straw-color; flowers of thin texture, 1½ to 2 lines long, borne in loose racemose panicles; calyx very short, forming a shallowly lobed saucer at base of corolla, the lobes broadly triangular-ovate, more or less acute; tube of corolla gradually widening upwards, deeply campanulate, lobes short, shorter than the tube, erect or slightly spreading, with inflexed acute tips; scales large, fringed; anthers not purple; capsule ovate or subglobose, thickened at the apex and somewhat pointed, enclosed by the distended corolla.

Native of South America, spreading almost throughout the world in seed of Medicago sativa: occurring in California at scattered localities, 10 to 2000 feet. Aug.-Oct.

Locs.—Santa Cruz Mts., *Horace Davis;* North Fork Kern River (Mem. Torr. Club 18:149); Andrus Isl., lower Sacramento River, *Jepson* 14,526; Myer's Ranch, South Fork Eel River, Humboldt Co., *Tracy* 5113.

Refs.—CUSCUTA SUAVEOLENS Ser., Ann. Sci. Phys. Nat. Agric. & Indust. 3:519 (1840), type loc. Rhone, Lyons, France; Yuncker, Mem. Torr. Club 18:148 (1932). *C. racemosa* var. *chiliana* Engelm., Trans. St. Louis Acad. 1:505 (1859), type loc. Chile, *Bertero* 205; Jepson, Man. 781 (1925).

6. **C. arvensis** Beyrich. FIELD DODDER. Stems rather fine, pale; flowers small, occasionally with lenticel-like glands, sessile or nearly so in dense globose clusters ½ inch thick; calyx-lobes obtuse, broad, about equaling tube of the corolla; corolla 1 line long, with acuminate lobes and short broad tube, in age remaining at base of capsule; scales often exceeding the tube and deeply fringed; capsule depressed-globose, with a distinct central pit; seeds 2 or 4.

Mostly moist or wet stations, 10 to 3500 feet: widely distributed and found in all continents. In our region it is common on Xanthium canadense and Trifolium pratense. Apr.-Sept.

Tax. note.—The name Cuscuta arvensis Beyrich (Engelm. in Gray, Man. ed. 2, 336,—1859) would appear to have been as well published as names of numerous other early species which are still accepted. That Engelmann included with it his C. pentagona, now regarded as distinct, does not invalidate C. arvensis according to common practice. There are very many old or Linnean species whose names still hold, even though the original group has been subject to subsequent segregation. Engelmann's Cuscuta arvensis as a name is not revertible, because the Cuscuta arvensis published in Hooker's Flora Boreali-Americana (2:77,—1840) is a nomen nudum. If a nomen nudum is of no effect (since without description), then logically it is as if never published. It is, therefore, illogical to treat the name in Hooker's Flora as of no effect, and at the same time having effect, namely, that it has the power to run against a later homonym. Therefore, the name C. campestris Yuncker is not used here. So far as Beyrich is concerned, he himself never published C. arvensis and his herbarium use of the name for a specimen of another species (to which appeal has been made) is of no moment under the International Rules. No part of the decision in determining the identity and proper name of a species has ever legally rested on an herbarium specimen under any section of the International Rules of Nomenclature. Which means, in this case, that a specimen or a manuscript herbarium record cannot be used to cancel a printed published description in whole or in part.

Locs.—Big Lagoon, Humboldt Coast, *Tracy* 7220; Centerville Beach, Eel River mouth, *Tracy* 12,997; Scott Valley, Lake Co., *Tracy* 8663; Bouldin Isl., lower San Joaquin River, *K. Brandegee;* Alvarado, *Jepson* 125c; Stanford, *C. F. Baker* 1761; Warm Creek, San Bernardino Valley, *Parish;* Redondo, *Geo. B. Grant.* L. Cal.: Soledad, *T. Brandegee.*

Refs.—CUSCUTA ARVENSIS Beyrich: Engelm. in Gray, Man. ed. 2, 336 (1859), "Virginia westward and southward to Illinois and Missouri"; Jepson, Fl. W. Mid. Cal. 389 (1901), ed. 2, 328 (1911), Man. 781 (1925). *C. obtusiflora* var. *glandulosa* Engelm., Trans. Acad. Sci. St. Louis

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1:492 (1859), type loc. Georgia, *Boykin;* Yuncker, Mem. Torr. Club 18:128 (1932). *C. campestris* Yuncker, Mem. Torr. Club 18:138 (1932), type loc. Texas, *Lindheimer* 126. *C. arvensis* Hook., Fl. Bor. Am. 2:77 (1838), as synonym without description.

Cuscuta cephalanthi Engelm., Am. Jour. Arts & Sci. 43:336 (1842), type loc. near St. Louis, *Engelmann;* Yuncker, Univ. Ill. Biol. Monog. 6:143 (1921). Flowers 4-merous, corolla somewhat persistent on capsule as a calyptra-like cap, or adherent to base of capsule.—Eastern United States; also Sisson ("Mt. Shasta"), *Geo. B. Grant* 5217, the material meagre and possibly doubtful.

7. **C. suksdorfii** Yuncker var. **subpedicellata** Yuncker. Stems slender; flowers small, $\frac{3}{4}$ to 1 line long, mostly short-pedicelled, few in umbel-like clusters; calyx with shallow tube and with long attenuate lobes reaching the middle of the corolla-lobes; corolla campanulate, 4 or 5-parted, its lobes acuminate, longer than the tube, persisting at the base of the capsule in age; scales oblong, shorter than the tube, represented by 2 dentate wings; capsule globose or subglobose, thin-walled, with a distinct central pit; seeds 2 to 4 (rarely only 1).

Montane slopes, on Calyptridium umbellatum, 6000 to 6500 feet: Siskiyou Co. July.

Locs.—Dry Lake Lookout, *L. C. Wheeler* 3011; East Fork Horse Creek.

Refs.—Cuscuta suksdorfii Yuncker, Mem. Torr. Club 18:167, fig. 41 (1932), type loc. Skamania Co., Wash., *Suksdorf* 1487. Var. subpedicellata Yuncker, Bull. Torr. Club 62:513 (1935), type loc. East Fork Horse Creek, *L. C. Wheeler* 3192.

8. **C. californica** H. & A. Chaparral Dodder. Stems capillary, often forming extensive tangles; flowers showy, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long, in loose cymes; pedicels frequently much thickened below the flower; calyx-lobes with short-attenuate spreading tips; corolla thin, membranous, its lobes lanceolate-subulate, equaling or longer than the campanulate tube, mostly reflexed in anthesis; scales none, sometimes represented by inverted arches or V-shaped thickenings alternating with the stamens, but situated near the base of the tube; anthers linear-oblong, nearly or quite equaled by the filaments; styles slender, mostly longer than the ovary; capsule depressed-globose, mostly 2 or 3-seeded.

Hill slopes, frequent in chaparral, especially on Eriogonum and Adenostoma, 50 to 5000 (or 10,000) feet: throughout cismontane California. North to Washington, south to Lower California. May-Sept.

Locs.—S. Cal.: Witch Creek, San Diego Co., *Alderson;* San Dieguito, *K. Brandegee;* Catalina Isl., *T. Brandegee;* Rubio Cañon, San Gabriel Mts., *Peirson* 150a; Azusa, Los Angeles Co., *Abrams* 1560 (on Eriogonum fasciculatum); Swartout Cañon, San Gabriel Mts., *G. R. Hall* (on Eriodictyon trichocalyx); Waterman Cañon, San Bernardino Mts., *Parish;* Palm Sprs. of San Jacinto, *Parish* 4130; Granite Wells, Mohave Desert, *Parish* 10,188. Coast Ranges: Jolon, *Jepson* 1704 (on Eriogonum fasciculatum); San Miguelito Rancho, San Antonio River, Monterey Co., *Jepson* 1628 (on Lotus scoparius); Pajaro Hills, Monterey Co., *Chandler* 423; San Francisco, *Gardner;* Potter Valley, *Jepson* 125a; Snow Mt., *K. Brandegee;* Little Red Mt., Mendocino Co., *Jepson* 16,526; Grasshopper Peak, Humboldt Co., *Constance* 692; Big Lagoon, Humboldt coast, *Tracy* 9160; Mary Blaine Mt., Trinity Co., *Tracy* 14,471; Cold Spr., w. Siskiyou Co., *Butler* 15. Sierra Nevada: Mt. Silliman, 10,000 ft., *K. Brandegee;* Badger, Tulare Co., *T. Brandegee* (on Monardella lanceolata); Eagle Lake, Lassen Co., *Brown & Wieslander* 85.

Var. **brachycalyx** Yuncker. Calyx very short, less than half the length of the broadly campanulate corolla-tube; corolla-lobes shorter than the tube, more obtuse.—Central and northern California. North to Oregon.

Locs.—Vacaville, Solano Co., *Jepson* 5d (on Centromadia pungens); Conn Valley, Napa Co., *Jepson* 70c (on Eriogonum nudum); Mt. Konocti, Lake Co., *Jepson* 5b (on Eriogonum nudum); Canoe Creek, Humboldt Co., *Tracy* 4760 (on Eriogonum nudum); Dugan, Eldorado Co., *K. Brandegee* (on Hemizonia).

Refs.—Cuscuta californica H. & A., Bot. Beech. 364 (1840), type from Cal., *Douglas;* Choisy, Mem. Soc. Phys. Hist. Nat. Geneva 9:279 (1841); Jepson, Fl. W. Mid. Cal. 389 (1901), ed. 2, 328 (1911), Man. 781 (1925). *C. californica* var. *breviflora* Engelm., Trans. St. Louis Acad. 499 (1859), type loc. Monterey, *Hartweg* 1863. *C. occidentalis* Millsp., Field Mus. Nat. Hist. Bot. 5:204 (1923), new name for preceding var. *C. californica* var. *longiloba* Engelm., l.c. 499 (1859), type loc. Santa Barbara, *Nuttall. C. californica* var. *graciliflora* Engelm., l.c. 499 (1859), type from Cal., *Douglas. C. californica* var. *apodanthera* Yuncker, Univ. Ill. Biol. Monog. 6:152 (1921), type loc. Yosemite Valley, *Jepson* 80a; corolla-lobes thin, anthers subsessile. *C. brachy-*

calyx var. *apodanthera* Yuncker, Mem. Torr. Club 18:159 (1932). *C. californica* var. *papillosa* Yuncker, Univ. Ill. Biol. Monog. 6:152 (1921), type loc. San Bernardino Valley, *Parish* 5524. Var. BRACHYCALYX Yuncker, Univ. Ill. Biol. Monog. 6:152 (1921), type loc. Hanford, *Kearney* 52; Jepson, Man. 781 (1925). *C. brachycalyx* Yuncker, Mem. Torr. Club 18:159 (1932). *C. jepsonii* Yuncker, Univ. Ill. Biol. Monog. 6:149 (1921), type loc. Big Horse Mt., n. Lake Co., *Jepson* 5e (on Ceanothus diversifolius); flowers papillate, calyx very short, corolla-lobes triangular.

CUSCUTA APPROXIMATA Bab. var. URCEOLATA Yuncker, Mem. Torr. Club 18:297 (1932), type loc. Sierra Nevada, Spain, *Kunze* 263. Stems very fine, golden, thread-like; flowers small, 1 to 2 lines long, in rather dense heads; style and stigma exceeding the ovary in length.—Old World species, a pest in alfalfa fields of Nevada and Oregon, casual in California (Yreka, *Butler* 536). Distinguished from our native species by a linear-elongated, rather than capitate, stigma.

CUSCUTA EUROPAEA L., Sp. Pl. 124 (1753), type European. Stigma linear-elongated as in the preceding, but style and stigma not exceeding the length of the ovary; flowers 1 to 1½ lines long, in a compact cluster.—European species, casual in California (Clear Lake, *Bolander* 2673 in part).

POLEMONIACEAE. GILIA FAMILY[1]

Ours herbs, or a few species somewhat woody at base. Leaves alternate or opposite, commonly lobed or divided or pinnately compound, or often simple and entire. Flowers complete, 5-merous, either solitary, in loose clusters, or capitate, racemose, corymbose or paniculate. Calyx synsepalous, 5-toothed or 5-cleft, persistent, regular or irregular. Corolla sympetalous, regular, its lobes convolute in the bud. Stamens 5, inserted on corolla, alternate with its lobes, often unequal in length. Ovary superior, 3-celled; style 3-cleft or with 3 stigmas. Capsule loculicidally 3-valved.—Most species of Langloisia and some species of Hugelia have an irregular corolla. In Navarretia some species have a 1-celled capsule, a 4-valved capsule or an indehiscent one, or a 4-merous corolla; many Navarretia species have a 2-cleft style, N. tagetina has a 4-cleft style and N. leucocephala an entire one. The pollen is either blue or golden. The seed-coats sometimes emit spiricles or become mucilaginous when wetted.—Genera 13, species about 250, mostly in North America, a few in South America, Europe and Asia.

The family Polemoniaceae finds its center of distribution in western North America. The group seems monophyletic and has developed many marked phases which have furnished a basis for genera. Such phases are, however, nearly always complicated by outlying forms which present the characteristics of two or more genera. Intermediates of this kind are often more stable than species of genera to which they are related. Decisions as to genera are, therefore, peculiarly difficult, on account of the overlapping of morphological characters. Many species, weighted this way or that by various authors, have been frequently transferred from one genus to another. Transference of uncertainly related species has involved the genera Phlox, Collomia, Loeselia, Gilia, Navarretia and Linanthus—to name only the more important ones and waiving segregate genera that have been more recently named or revived. All genera of Polemoniaceae have at one time or another been subjected to transference of species and on account of this fact there would be a certain logic in assembling all these genera, the ones listed in this flora save Polemonium, under one generic name. Such a step, however, would involve not merely the depreciation of various groups which carry on the whole significant morphological characters but also tend to obscure the striking ecological characteristics which emphasize certain generic trends. If, on the other hand, every morphologic phase be recognized by a generic name and one thus avoid all overlapping of characters—in this way dispose completely of intermediate forms— the multiplication of genera would be carried very far. In consequence it has here seemed better, on the combined basis of morphology, ecology and geography, to adopt a moderate course and limit somewhat the number of genera. Intermediate genera are freely admitted, not as a vexation, but as lending to the arrangement an evolutionary interest which is very striking, even if only partially understood. Judgments, to be sure, differ as to the evaluation of Hugelia, Navarretia, Leptodactylon, Siphonella, Linanthus, Gymnosteris and Langloisia, which have been, hitherto, most commonly referred to Gilia as subgenera or sections. All these are recognized as genera in this treatment and, aside from the status assigned them, are undoubtedly natural groups as here constituted. Collomia, here recognized as a genus, seems in some respects artificial. In relation to this genus and to other genera of this family, cytological evidence is of interest. The following facts as to chromosome numbers are taken from the paper of W. S. Flory in Cytologia (Fujii jub. vol. 171–180). Various species of Collomia have 8 pairs of chromosomes and are thus distinguished cytologically from other genera of Polemoniaceae. Although, in its gross morphology, Hugelia is not markedly differentiated from Gilia, Flory finds that Hugelia, so far as known, has 7 pairs of chromosomes as contrasted with 9 pairs for true Gilia. Linanthus and Leptodactylon have 9 pairs of chromosomes as in Gilia but the chromosomes are measurably smaller. The basic chromosome number in Phlox appears to be 7, while the species of Polemonium have 9 pairs of chromosomes.

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[1] The manuscript of the families Polemoniaceae, Hydrophyllaceae, Boraginaceae and Labiatae was prepared in the years 1910 to 1915 and further revised in later years in the light of subsequent collections and the published literature. During the years 1938 to 1940 two able assistants aided in the work: Virginia L. Bailey and Robert F. Hoover. Their names appear frequently in the text in connection with special contributions. The manuscript of the families Lennoaceae to Labiatae has been proof-read by Frank W. Peirson who has also contributed data regarding the altitudinal range of many high-montane species, especially in the southern Sierra Nevada where he has done distinguished field work. The manuscript of the families Lennoaceae to Convolvulaceae was also proof-read by Joseph P. Tracy, especially in relation to the flora of Humboldt County, where he has carried on, over a period spanning some forty years and more, highly useful studies on the indigenous seed plants.—W. L. J., December 14, 1940.

Bibliog.—Bentham, G., [new genera and species of Polemoniaceae] Bot. Reg. 19, sub. t. 1622,—1833. Gray, A., Revision of the N. Am. Polemoniaceae (Proc. Am. Acad. 8:247–282,—1870). Greene, E. L., Some American Polemoniaceae.—I. (Pitt. 1:120–139,—1887); II. (Pitt. 2:251–260,—1892); [types of Californian species of Gilia], (Erythea 3:103–105,—1895); [new spp. of Gilia], (Erythea 3:120–121,—1895); Some western Polemoniaceae (Pitt. 3:299–305,—1898). Milliken, J., A review of Cal. Polemoniaceae (Univ. Cal. Publ. Bot. 2:1–71, pls. 1–11,—1904). Eastwood, A., Some new species of western Polemoniaceae (Bot. Gaz. 37:437–447,—1904). Brand, A., Kulturversuche mit verschiedenen Polemoniaceen-Arten (Engler, Botanische Jahrbücher 36:69–77,—1905); Polemoniaceae (Engler, Pflzr., 4^{250}:1–203, figs. 1–39,—1907); Neue Beiträge zur Kenntnis der Polemoniaceen (Ann. Conserv. et Jard. Bot. Genève 15–16:322–342,—1913). Nelson, A., & Macbride, J. F., Gilia and Collomia (Bot. Gaz. 61:34–35,—1916). Macbride, J. F., Gilia virgata and allies (Contrib. Gray Herb. 49:51–58,—1917). Craig, Thos., A revision of the subgenus Hugelia of the genus Gilia (Bull. Torr. Club, 61:385–396, pl. 23,—1934; 61:411–428,—1934). Constance, L., and Rollins, R. C., Gilia congesta and its allies (Am. Jour. Bot. 23:433–440,—1936). Constance, L., The type locality for Gilia congesta (Lflts. W. Bot. 2:21–22,—1937). Mason, H. L., Two new species of Linanthus from western N. Am. (Madroño 4:157–160, pl. 28,—1938). Flory, W. S., Chromosome numbers in the Polemoniaceae (Cytologia, Fujii jub. vol. 171–180,—1937).

A. Corolla regular.

Leaves pinnately compound, the leaflets sessile on the rachis, the uppermost sometimes confluent; corolla tubular-funnelform to nearly rotate; calyx wholly herbaceous (that is, without membranous intervals below the sinuses), not ruptured by the mature capsule; ours perennials, one species annual........1. POLEMONIUM.

Leaves simple and entire, or toothed, cleft or divided; calyx with or without membranous intervals below the sinuses, usually ruptured by the mature capsule (except in Collomia).

Corolla strictly salverform, the tube distinctly contracted at the throat; leaves opposite (sometimes alternate above), entire; perennials, mostly montane........2. PHLOX.

Corolla funnelform to salverform or campanulate, the throat open.

Leaves alternate (rarely some of the lower opposite).

Leaves palmately parted, pungent, much fascicled in the axils; undershrubs, mostly montane........3. LEPTODACTYLON.

Leaves entire or pinnately toothed, cleft or divided.

Calyx-lobes unequal, pungent.

Anthers oval; bracts green or chartaceous or coriaceous, hairy or glabrous; annuals, mostly of summer or late spring in dry ground........4. NAVARRETIA.

Anthers sagittate; bracts mostly embedded in white wool, the lower part often nearly concealed; (corolla irregular in one species); perennials or annuals........5. HUGELIA.

Calyx-lobes equal, rarely pungent; mostly annuals, some perennials.

Calyx-sinuses distended at notch into a revolute lobe; stamens mostly unequal, unequally or equally inserted in the corolla-throat........6. COLLOMIA.

Calyx-sinuses not distended into a lobe; stamens mostly equal, mostly equally inserted in corolla-throat or corolla-sinuses........7. GILIA.

Leaves opposite; corolla mostly salverform.

Stems without proper foliage leaves, bearing at base persistent cotyledons and above a whorl of involucral leaves connate at base; diminutive annuals with simple stems; transmontane........8. GYMNOSTERIS.

Stems leafy, the leaves palmately parted or sometimes entire.

Slender low annuals, mostly of spring; cismontane and transmontane, mostly of low hills or valleys........9. LINANTHUS.

Perennial herbs, mostly summer-flowering; montane........10. SIPHONELLA.

B. Corolla 2-lipped, or the 5 equal lobes somewhat obscurely disposed in 2-lipped fashion to subregular.

Leaves margined with long bristles; corolla strongly bilabiate to regular, its tube rather short (3 to 5 or 6 lines); corolla-lobes entire; low annuals; mostly transmontane deserts............ 11. Langloisia.

Leaves not bristly; corolla in ours subregular, its tube very long (9 to 13 lines); corolla-lobes in ours 3-toothed; perennials; Colorado Desert...12. Loeselia.

1. POLEMONIUM L. Jacob's Ladder

Herbs. Leaves alternate, pinnate, the leaflets sessile; petioles of basal leaves with broad scarious bases. Flowers showy, blue, pink or white, in racemes, cymes or panicles. Calyx herbaceous throughout, not scarious below the sinuses, more or less accrescent and loosely investing the capsule. Corolla from tubular-funnelform to nearly rotate. Filaments equally inserted, more or less declined and hairy at base. Seeds few or several in each cell, becoming mucilaginous when moistened.—Species about 14, North and South America, Europe, Asia. (Greek name used by Dioscorides, from polemos, war, the application not obvious.)

- Flowers solitary, opposite the leaves; corolla equaling or shorter than the calyx; calyx-lobes spreading; annual...1. *P. micranthum.*
- Flowers in racemes, panicles or heads; corolla longer than the calyx; calyx-lobes erect; perennials.
  - Flowers in a raceme or panicle; corolla-lobes equaling or longer than the tube; leaflets entire.
    - Corolla blue, 4 to 7½ lines long; high montane.
      - Stems short, several from a simple or branched root-crown.
        - Leaf-lobes oblong or elliptic, thin, discrete, 4 to 8 lines long; style exceeding corolla; meadows, stream margins, Sierra Nevada and Siskiyou Co..... 2. *P. pulcherrimum.*
        - Leaf-lobes ovate or oblong-ovate to suborbicular, thick, crowded, 1 to 2½ (or 3) lines long; style shorter than corolla, rarely exceeding it a little; rocky peaks and ledges, n. Sierra Nevada and Trinity Co...................... 3. *P. parvifolium.*
      - Stems tall, mostly solitary from a horizontal rootstock; style exceeding corolla; San Bernardino Mts. and Sierra Nevada....................................4. *P. occidentale.*
    - Corolla pink, 7 to 12 lines long; style shorter than the corolla; along coast..5. *P. carneum.*
  - Flowers in capitate-congested heads; corolla-lobes shorter than the tube; leaflets palmately cleft or divided; high montane..6. *P. confertum.*

1. **P. micranthum** Benth. (Fig. 366.) Stems 1 to many from the base, commonly branched, erect or ascending, 4 to 8 inches high; herbage viscid-puberulent to glabrous; leaves about 1 to 2 inches long; leaflets 5 to 15, elliptic to linear or lanceolate, 1 to 2 lines long; flowers solitary, opposite the leaves, the inflorescence thus a loose false raceme; pedicels slender, 1 to 3 lines long; calyx 2 to 3 lines long, nearly twice as large in fruit and becoming chartaceous, the lobes tending to spread; corolla white, subrotate, shorter than or not exceeding the calyx; style very short; cells of the ovary 2 or 3-ovuled.

Dry open ground, 2000 to 4500 (or 6800) feet: mountains on northwest side of the Mohave Desert; east and north sides of the northern Sierra Nevada from Sierra Co. to Siskiyou Co. East to Utah and Idaho, north to Washington. Mar.-Apr.

Geog. note.—A considerable number of species of various families from the northern part of the Great Basin enter northeastern transmontane California and also recur in ranges or areas bordering the western Mohave Desert, but are largely or completely absent from the intervening region, that is the Sierra Nevada and its east side. Polemonium micranthum is one of these. It is found in the Tehachapi Mts. (Girard sta., *K. Brandegee*) and Mt. Piños region (Camp Ozena, Cuyama Valley, *Hoffmann*), and at the following localities in Sierra, Modoc and Siskiyou Cos.: Sierra Valley, *Lemmon;* Alturas, *B. C. Goldsmith;* Mill Creek Mdws., Warner Mts., *Cronemiller* 20; Goose Lake Valley, Modoc Co., *R. M. Austin;* Little Shasta, *Hooper;* Yreka, *Butler* 557.

Refs.—Polemonium micranthum Benth.; DC., Prodr. 9:318 (1845), type from the Columbia River, *Douglas;* Jepson, Man. 782 (1925). *Polemoniella micrantha* Hel., Muhl. 1:57 (1904).

2. **P. pulcherrimum** Hook. (Fig. 367.) Stems few to many, erect or ascending, 5 to 10 inches high, these and the chiefly basal leaves arising from the crown

of a running rootstock; herbage viscid-pubescent or -pilose and mephitic; leaves 1 to 6 inches long; leaflets 11 to 21 (the cauline with fewer leaflets), oblong or elliptic, 4 to 8 lines long; flowers in close racemose cymes; calyx little accrescent; corolla pale blue or purple with a yellow or white throat, cleft to below the middle, 2½ to 5 lines long, 1¼ to 2 times as long as the calyx; stamens included; style slightly exserted; cells of the capsule 1 to 3-seeded.

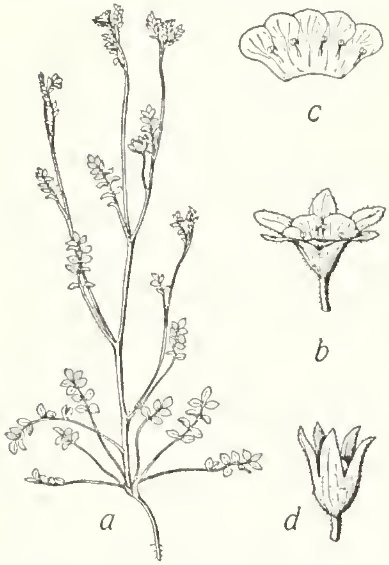

Fig. 366. Polemonium micranthum Benth. *a*, habit, × ½; *b*, fl., × 3; *c*, corolla laid open, × 3; *d*, fruiting calyx, × 1.

Deep rich soil of moist shaded places in the mountains, in meadows, stream flats and pine woods, 6000 to 9800 (or 11,000) feet; Sierra Nevada from Fresno Co. to Sierra Co.; western Siskiyou Co. East to the Rocky Mts., north to Washington. June-July.

Locs.—Sierra Nevada: Nellie Lake, Fresno Co., *A. L. Grant* 1020; Kaiser Crest, Fresno Co., *Jepson* 13,011; Yosemite Creek trail, Yosemite, *A. L. Grant* 1282; Rancheria Mt., s. Tuolumne Co., *Jepson* 3403; Mt. Conness, Tuolumne Co., *Jepson* 4481; Summit sta., Nevada Co., *Jepson* 14,997; Webber Lake, Sierra Co., *Lemmon*. Western Siskiyou Co.: Marble Mt., *Butler* 26.

Refs.—Polemonium pulcherrimum Hook., Bot. Mag. t. 2979 (1830), type from the n. Rocky Mts., *Drummond;* Jepson, Man. 782 (1925). *P. humile* B. & W., Bot. Cal. 1:499 (1876); not Willd. (1819). *P. humile* var. *pulchellum* Gray, Syn. Fl. 2:150 (1878), based, as to the description, upon plants from the Northwest Coast south to Colorado and the Sierra Nevada. *P. tricolor* Eastw., Bot. Gaz. 37:439 (1904), type loc. Marble Mt., Siskiyou Co., *Chandler* 1671. *P. pulcherrimum* subsp. *tricolor* Brand; Engler, Pflzr. 4^{250}:35 (1907). *P. californicum* Eastw., Bot. Gaz. 37:437 (1904), type loc. Snow Flat, ne. Mariposa Co., *Eastwood*. *P. calycinum* Eastw., l.c. 438 (1904), type loc. near Cinder Cone, Lassen Co., e. of Lassen Peak, *Bruce* 1212. *P. pulcherrimum* var. *calycinum* Brand, l.c.

3. **P. parvifolium** Nutt. (Fig. 368.) Stems few to many, a little scape-like, erect or ascending from a branched root-crown, 2½ to 7 inches high; herbage glabrous to minutely glandular-puberulent; leaves 1 to 2 (or 4½) inches long; leaflets 11 to 21, mostly crowded (the cauline leaves with fewer leaflets), ovate or oblong-ovate to sub-orbicular, thick and firm in texture, 1 to 2½ (or 3) lines long; flowers few to several in a slightly loose terminal cymose cluster; corolla blue, 3½ to 4 lines long, its tube rather shorter than the calyx.

High montane rocky slopes, 7800 to 10,800 feet: Sierra Nevada from Mono and Tuolumne Cos. to eastern Siskiyou Co.; northern Trinity Co. Northeast to Wyoming and Montana. June-Aug.

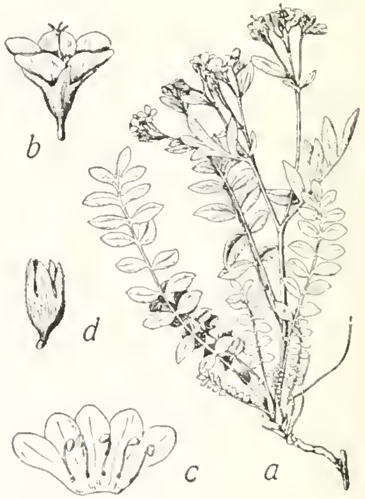

Fig. 367. Polemonium pulcherrimum Hook. *a*, habit, × ⅓; *b*, fl., × 2; *c*, corolla laid open, × 2; *d*, fruiting calyx, × 2.

Geog. note.—Polemonium parvifolium, a plant of the northern continental divide in the United States, ranges from Montana southwest across the Great Basin into the northern Sierra Nevada and the far northern Coast Ranges of California. It falls into the category of species which inhabit each one of three small areas in northern California—areas of critical importance distributionally, namely Lassen Peak, Mt. Shasta and the Salmon Mts. of northern Trinity County. It has not as yet been found in the high Marble Mountains country of western Siskiyou County.

Locs.—Sierra Nevada: Lundy, w. Mono Co., *Maud Minthorn* 214; Long Mdw., Tuolumne Co., *Chesnut & Drew;* Sonora Peak, Alpine Co., *A. L. Grant* 403; Keiths Dome, near Fallen Leaf Lake, *Ottley* 801; Mt. Tallac, Eldorado Co., *Jepson* 8142; Lassen Peak, *Chesnut & Drew;* Mt. Shasta, *Jepson* 14,998. Trinity Co.: Twin Lakes to Thompson Peak, *Alexander & Kellogg* 296.

Refs.—Polemonium parvifolium Nutt.; Rydb., Bull. Torr. Club 24:253 (1897). *P. pulcherrimum* var. *parvifolium* Nels., Man. Rocky Mt. Bot. 404 (1909); Jepson, Man. 783 (1925). *P. pulcherrimum* subsp. *parvifolium* Brand; Engler, Pflzr. 4^{250}:35 (1907). *P. mexicanum* Nutt., Jour. Acad. Phila. 7:41 (1834), type loc. Flat-Head River, Mont., *Wyeth;* not Cerv. (1816). *P. viscosum* Gray, Syn. Fl. 2:150 (1878); not Nutt., acc. Rydberg, Bull. Torr. Club 24:253 (1897). *P. haydenii* Nels., Bull. Torr. Club 26:353 (1899), type loc. Jacksons Hole, Snake River, Wyo., *Hayden. P. pulcherrimum* var. *haydenii* Brand; Engler, Pflzr. 4^{250}:35 (1907). *P. tevisii* Eastw., Bot. Gaz. 37:440 (1904), type loc. Desolation Valley, near Lake Tahoe, *Berry. P. berryi* Eastw., l.c. 440, type loc. Desolation Valley, near Lake Tahoe, *Berry. P. pulcherrimum* var. *berryi* Brand, l.c. 36. *P. shastense* Eastw., Bull. Torr. Club 32:205 (1905), type loc. Mt. Shasta, *Copeland* 3515. *P. pulcherrimum* var. *berryi* subvar. *shastense* Brand, l.c. 36. *P. montrosensis* Nels., Proc. Biol. Soc. Wash. 18:174 (1905), type loc. Mt. Rose, Nev., *Doten.*

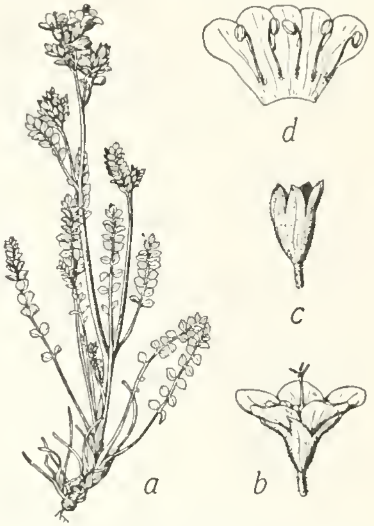

Fig. 368. Polemonium parvifolium Nutt. *a*, habit, × ½; *b*, fl., × 1½; *c*, fruiting calyx, × 1½; *d*, corolla laid open, × 1½.

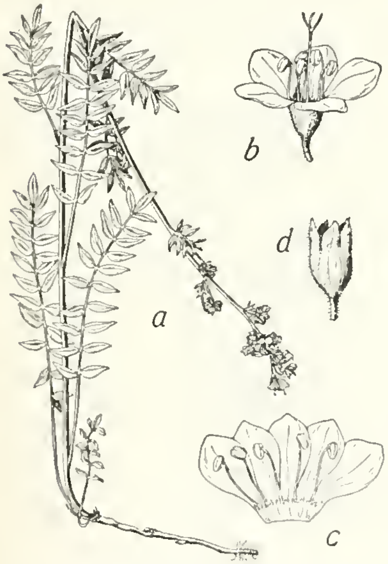

Fig. 369. Polemonium occidentale Greene. *a*, habit, × ⅙; *b*, fl., × 1; *c*, corolla laid open, × 1; *d*, fruiting calyx, × 1⅓.

4. **P. occidentale** Greene. (Fig. 369.) Stem erect, simple, solitary from a running root-stock, 1¼ to 3¾ feet high; herbage glabrous below, glandular toward the inflorescence; leaves mainly cauline, long-petioled, 3 to 14 inches long; leaflets 11 to 25, ovate-oblong or lanceolate, 4 to 15 lines (or 2 inches) long; flowers in a thyrsoid or corymbose cluster; calyx scarcely accrescent, remaining firm, becoming 4 lines long; corolla blue or purple, subcampanulate, cleft to below the middle, 5 to 7 lines broad, about twice as long as the calyx, its tube white or yellowish, hairy at insertion of stamens; cells of the capsule 6 to 12-seeded; style exceeding the corolla.

Wet ground or swamps in the mountains, 4000 to 10,900 feet: San Bernardino Mts.; Sierra Nevada from Tulare Co. to eastern Siskiyou Co. East to the Rocky Mts., north to Washington. June-July.

Locs.—San Bernardino Mts.: Bear Valley (Erythea 7:94); South Fork Santa Ana River. Sierra Nevada: Volcano Creek, e. Tulare Co., *Jepson* 4936; Yosemite, *Dodd;* Sonora Peak, *A. L. Grant* 391; near Cascade Lake, Lake Tahoe, *Ottley* 1207; Blairsden, Plumas Co.; Bridge Creek, Lassen Co., *Baker & Nutting;* Willow Creek Valley, Modoc Co., *R. M. Austin;* Sisson, Siskiyou Co., *Blasdale.*

Refs.—Polemonium occidentale Greene, Pitt. 2:75 (1890), "Rocky Mts. of Colorado and ... the Californian Sierras"; Jepson, Man. 783 (1925). *P. helleri* Brand; Engler, Pflzr. 4^{250}:32 (1907), type from Truckee, *Heller*, apparently only a filamentless mutant. *P. coeruleum* Gray, Bot. Cal. 1:500 (1876), and various western authors; not L.

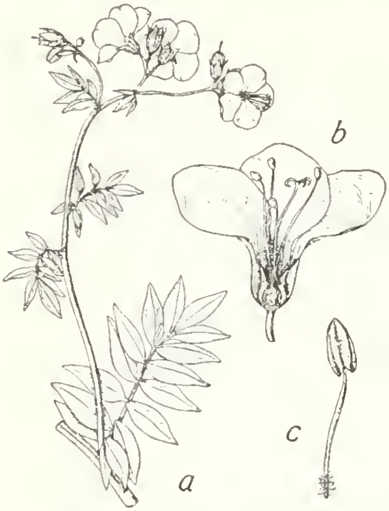

Fig. 370. Polemonium carneum Gray. *a*, fl. branch, × ⅓; *b*, long. sect. of fl., × 1; *c*, stamen, × 1½.

5. **P. carneum** Gray. (Fig. 370.) Stems erect, ascending or climbing, few to many from a densely branched root-crown, 1 to 4 feet high, usually widely branched above; herbage subglabrous or thinly pubescent; leaves 3 to 8 inches long; leaflets 12 to 19, ovate or oblong-lanceolate, thin, ½ to 1½ inches long; flowers in loose terminal corymbose or subumbellate few-flowered clusters; calyx greatly accrescent in fruit, becoming chartaceous and 5 to 8 lines long; corolla pink to purple, broadly funnelform, cleft to a little below middle, 7 to 12 lines long, 2 to 3 times as long as the calyx; stamens and style included; ovary-cells 3 or 4-ovuled.

Moist shaded ground or open grassy hills along the coast, 50 to 2000 feet, uncommon: Coast Ranges from San Mateo Co. and western Alameda Co. to Del Norte Co.; thence east to western Siskiyou Co., 4000 to 6000 feet. North to southern Oregon. Apr.-May.

Locs.—Pilarcitos reservoir, San Mateo Co., *Davy* 1040; Stonybrook Creek, w. Alameda Co., *Mason;* Sausalito, *Kellogg;* Bodega, Sonoma Co., *Ewan* 9207; Bear River Ridge, Humboldt Co., *Tracy* 8440; Big Lagoon, Humboldt Co., *Tracy* 6682; Smith River Indian Reservation, Del Norte Co., *Ruby Van Deventer* 317; Gilbert Creek, Del Norte Co., *Jepson* 9358; Marble Mt., w. Siskiyou Co., *Jepson* 2827; McAdam Creek, w. Siskiyou Co., *Butler* 1344. Ore.: Ashland (e. of), *R. M. Austin.*

Refs.—Polemonium carneum Gray, Syn. Fl. 2:151 (1878), type loc. Siskiyou Co., *Greene;* Jepson, Fl. W. Mid. Cal. 423 (1901), ed. 2, 328 (1911), Man. 783 (1925). *P. carneum* subsp. *genuinum* Brand; Engler, Pflzr. 4^{250}: 41 (1907). *P. carneum* var. *luteum* Gray, Syn. Fl. ed. 2, 2:412 (1886), type loc. Cascade Mts., Ore., *Howell. P. carneum* subsp. *luteum* Brand, l.c. 41.

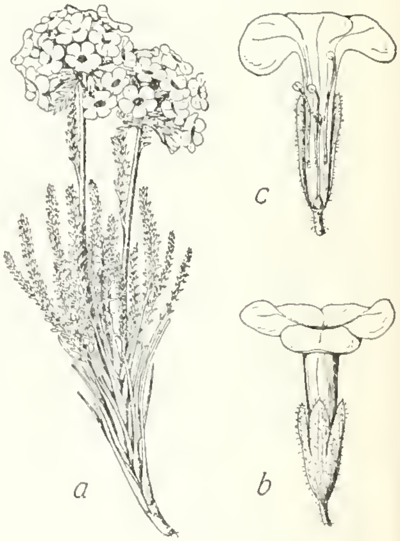

Fig. 371. Polemonium confertum Gray var. eximium Jepson. *a*, habit, × ⅜; *b*, fl., × 1½; *c*, long. sect. of fl., × 1½.

6. **P. confertum** Gray **var. eximium** (Greene) Jepson. Sky-Pilot. (Fig. 371.) Stems and basal leaves very densely tufted on the branched root-crown; stems several, bearing 1 or a few reduced leaves and a dense capitate cluster of blue flowers; leaves linear in outline, glandular-viscid and musk-scented, 1 to 5 inches long; leaflets numerous, ½ to 1½ lines long, usually approximate or imbricate, palmately divided into 2 to 5 segments; corolla salverform, the tube 3 to 5½ lines long, nearly twice as long as the calyx and much longer than the lobes; stamens included, rarely somewhat exserted from corolla-tube; cells of ovary with 3 to 5 ovules; style included.

Rocky ledges, 10,000 to 14,000 feet.: Sierra Nevada from Tuolumne Co. to Tulare Co. July-Aug.

Geog. note.—In its typical form Polemonium confertum of the Rocky Mountains region is distributed from Wyoming to Utah and New Mexico. From it have been segregated Polemonium eximium Greene and P. chartaceum Mason, both Californian plants. It does not seem that either of these segregates has characters of sufficient weight to warrant more than varietal rank, especially in view of the fact that the species, Polemonium confertum, is so variable in those features that are used as distinguishing marks for the segregates. Length of stamens, quite variable in the species, reaches two extremes in P. chartaceum with exserted and in P. eximium with included ones. Even this character is variable, since material from Mt. Lyell and Mt. Dana (*Lemmon*), definitely referable to P. eximium, has stamens shortly exserted. Therefore, these two segregates are disposed in this text in varietal rank.—W. L. Jepson and Virginia Bailey.

The following stations validate the range of var. eximium: Mt. Dana, *Jepson* 3295a; Mt. Lyell, *Jepson;* Palisade basin, e. Fresno Co., *E. Ferguson* 515; near Simpson Mdw., Middle Fork Kings River, *Henrietta M. Eliot;* Kearsarge Pass, *Jepson* 857; Harrison Pass, *Jepson* 5038; Mt. Whitney, *K. D. Jones.*

Var. **chartaceum** (Mason) Jepson comb. n. Habit and leaves as in var. eximium; calyx turbinate, shorter than corolla-tube; corolla sky blue, funnelform, 5 to 7½ lines long, the tube nearly twice as long as the lobes; stamens exserted; style equaling or much exceeding the corolla.—High rocky slopes, 6000 to 14,200 feet: White Mts. (Inyo and Mono Cos.); Trinity Mts. July-Aug.

Geog. note.—Polemonium confertum var. chartaceum grows on the highest peaks of the White and Sweetwater mountains, desert ranges on the western margins of the Great Basin. On White Mountain Peak, where it was discovered in 1917, it occurs from 13,500 feet to the summit, 14,242 feet. In the Sweetwater Mountains it has been found on Patterson Peak (*Hoover* 5548). In 1934 it was collected on Mt. Eddy (Dobkins Lake, *D. H. Johnson*) at the north end of the Trinity Mts. This station is not necessarily out of harmony with the stations in the White and Sweetwater mountains, since a certain number of species of the west side of the Great Basin enter the northern portion of the high inner North Coast Range, a distribution which in its westernmost extension represents a thin or narrow geographic thrust. Polemonium confertum var. chartaceum matches P. confertum var. eximium in habit, aspect, leaves and inflorescence and differs only as to details of the flower. The broad sheathing chartaceous bases of the leaves are characteristic of all our species, but especially evident in those which are alpine in growth-form. Aside from all this, the leaves, as a matter of analogy, may advantageously be compared with the leaves of Potentilla argyrocoma, P. santolinoides, P. muirii and P. hispidula, and some other alpine and subalpine species.

Refs.—POLEMONIUM CONFERTUM Gray, Proc. Acad. Phila. 15:73 (1863), type from the Rocky Mts. of Colo., *Hall & Harbour* 450. Var. EXIMIUM Jepson, Man. 783 (1925). *P. eximium* Greene, Pitt. 3:305 (1898), type loc. Mt. Conness, Tuolumne Co., *Harford*. *P. confertum* B. & W., Bot. Cal. 1:500 (1876); Jepson, Fl. W. Mid. Cal. ed. 2, 328 (1911). Var. CHARTACEUM Jepson. *Polemonium chartaceum* Mason; Jepson, Man. 783 (1925), type loc. White Mountain Peak, *Jepson* 7383.

2. PHLOX L.

Low perennial herbs, or sometimes a little woody at base. Leaves mostly opposite, their blades entire, sessile. Flowers in cymes, blue to lavender, pink, red or white. Calyx narrow, hyaline between the lobes. Corolla strictly salverform, the lobes entire or bifid, the tube slender, the throat constricted. Stamens very short, mostly included, unequally inserted in the corolla-tube (often in pairs, 2 upper, 2 median and the odd one below). Ovules 1 or few in each cell of the ovary. Capsule finally rupturing the persistent calyx. Seed-coats not changed when wetted.—Species about 30 in North America, 1 in Siberia. (Greek phlox, flame, the ancient name for Lychnis, transferred by Linneaus to these plants.)

Bibliog.—Nelson, E., Revision of the western North American Phloxes (Ann. Rep. Wyo. Agr. Coll. 9: Phloxes 1–36,—1899). Nelson, A., Phlox longifolia and P. stansburyi and their immediate relatives (Am. Jour. Bot. 18:441–442,—1931). Wherry, E. T., Four southwestern subspecies of Phlox (Jour. Wash. Acad. 29:517,—1939).

Leaves ovate or elliptic; North Coast Ranges........1. *P. adsurgens.*
Leaves narrowly linear to linear-lanceolate.
Corolla-tube 1 to 2 times as long as calyx.
Corolla-lobes markedly notched at apex; style shorter than calyx; plants tall, diffuse; chiefly cismontane Sierra Nevada and North Coast Ranges........2. *P. speciosa.*
Corolla-lobes entire or merely retuse.
Stems forming a rough mat or cushion; leaves linear or somewhat needle-like, much fascicled in the axils; style shorter than the calyx; high montane........3. *P. douglasii.*
Stems erect, either few and slender or many and tufted; leaves narrowly lanceolate to linear, not fascicled in the axils or only rarely; style longer than calyx (except one var.); transmontane deserts........4. *P. stansburyi.*
Corolla-tube 3 to 4 times as long as calyx; transmontane or essentially so......5. *P. dolichantha.*

1. **P. adsurgens** Torr. Stems diffuse or ascending, simple or sparingly branched, 4 to 10 inches long, arising from slender creeping root-stocks; herbage glabrous, the pedicels glandular-puberulent; leaf-blades elliptic to ovate, 6 to 14 lines long; flowers in terminal few-flowered cymes; pedicels mostly longer than calyx; calyx glandular-pubescent, its lobes subulate, spreading or recurved, longer than the tube; corolla pink or pinkish-white, ¾ to 1 inch long, its lobes entire, about half as long as the tube; stamens very unequal, the 2 of higher insertion often exserted; style equaling or longer than the corolla-tube; ovary-cells 1-ovuled.

Coniferous woods, 1400 to 6000 feet: Mendocino Co. to western Siskiyou Co. North to Oregon. May-July.

Locs.—Mendocino Co., *W. W. Price;* near Three Creeks, n. Humboldt Co., *Davy* 5708; betw. Mud Spr. and Trinity Summit, *Jepson* 2028; Somes Bar, Klamath River, *Chandler* 1534; betw. Cottage Grove and Elbow Camp, Siskiyou Mts., *Jepson* 2861.

Refs.—Phlox adsurgens Torr.; Gray, Proc. Am. Acad. 8:256 (1870), type loc. "Cañon Pass, Ore.," *A. Wood;* Wats., Garden and Forest, 1:66, fig. 11 (1888); Jepson, Man. 786 (1925).

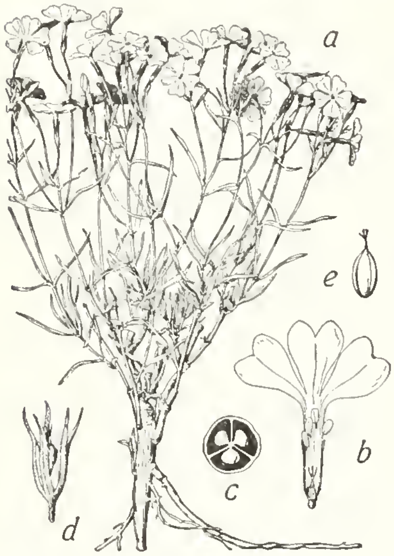

Fig. 372. Phlox speciosa Pursh. *a*, habit, × ⅓; *b*, long. sect. of fl., × 1; *c*, cross-sect. of ovary, × 3; *d*, calyx and capsule, × 1; *e*, capsule, × 1.

2. **P. speciosa** Pursh. (Fig. 372.) Stems several, erect or ascending from a branched woody root-crown, 4 to 20 inches high; herbage puberulent or the leaves sometimes glabrous; leaf-blades linear or lanceolate to narrowly ovate, ½ to 1¾ inches long; flowers in a terminal few to several-flowered cyme; calyx puberulent, ½ to ⅘ as long as corolla-tube, its lobes short-subulate, ½ to as long as the calyx-tube; corolla reddish-purple or rose-pink to lavender, its tube 6 to 7 lines long, the lobes obcordate (rarely entire), 4½ to 5½ lines long; stamens unequal, included; anthers and pollen yellow; style shorter than calyx.

Open rocky hillsides or openly forested slopes, 1500 to 5000 feet: North Coast Ranges from Sonoma Co. to western Siskiyou Co. and Del Norte Co.; Sierra Nevada from Fresno Co. to Shasta and Modoc Cos. East to Arizona, north to Washington and Idaho. Apr.–July.

Locs.—North Coast Ranges: Healdsburg (5 mi. w., on Jensen ranch), *M. S. Baker* 2718c; South Yollo Bolly, *Jepson* 14,987; Edgewood, Siskiyou Co., *Kisling;* Yreka, *Butler* 650; Low Divide, Del Norte Co., *R. Van Deventer* 65; Gasquet, Del Norte Co., *Tracy* 11,299. Sierra Nevada: Millwood, s. Fresno Co., *Jepson* 2779a; Groveland, s. Tuolumne Co., *L. S. Smith;* Yankee Hill, Columbia, n. Tuolumne Co., *Jepson* 6405; Rough-and-Ready, w. Nevada Co., *Jepson* 14,988; Rebel Ridge, near Camptonville, Yuba Co., *L. S. Smith* 1756; Red Hill, Plumas Co., *W. I. Follett* 14; near Redding, *C. F. Rose* 25; Dixey Mts., Lassen Co., *Baker & Nutting;* Hayden Hill, Modoc Co., *L. S. Smith* 922.

Refs.—Phlox speciosa Pursh, Fl. 149 (1814), type loc. "plains of Columbia" River, *Lewis;* Jepson, Man. 786 (1925). *P. speciosa* var. *latifolia* Hook., Jour. Bot. 3:289 (1851), type loc. "mountain meadows, plateaux of the Coeur d'Alene and Nez Perces," Ida., *Geyer. P. speciosa* subsp. *euspeciosa* var. *latifolia* Brand; Engler, Pflzr. 4^{250}:74 (1907). *P. divaricata* var. *occidentalis* Dur., Jour. Acad. Phila. n. s. 3:97 (1855), type loc. "vicinity of Nevada" City, Nevada Co., *Pratten. P. occidentalis* Dur.; Torr., Pac. R. Rep. 4:125 (1856), type loc. "hillsides near Duffield's Ranch" (that is, 3½ mi. e. of Confidence, Tuolumne Co.), *Bigelow. P. speciosa* subsp. *euspeciosa* var. *latifolia* f. *occidentalis Brand,* l.c. (1907). *P. lanceolata* E. Nels., Ann. Rep. Wyo. Agr. Coll. 9:29 (1899), type loc. Ellensburg, Wash., *Piper. P. speciosa* subsp. *euspeciosa* var. *latifolia* f. *lanceolata* Brand, l.c. (1907). *P. speciosa* var. *nitida* Suksd., Deutsche Bot. Monatsschr. 18:132 (1900), type loc. w. Klickitat Co., *Suksdorf. P. speciosa* subsp. *euspeciosa* var. *latifolia* subvar. *nitida* Brand, l.c. (1907). *P. longifolia* Mlkn., Univ. Cal. Publ. Bot. 2:65 (1904); not Nutt. *P. longifolia* var. *puberula* Mlkn., l.c. 66; not E. Nelson.

3. **P. douglasii** Hook. Stems many from the root-crown, erect, forming a dense tuft or rough mat 2 to 8 inches high and 3 to 12 inches broad, the branches of the root-crown mostly short and erect, sometimes long and prostrate; herbage green and lightly pubescent to gray pubescent, or the leaves merely ciliate below, the upper portion glabrous or subglabrous; leaves densely clothing the branchlets, sometimes with similar leaves fascicled in the axils, the blades linear or subulate, 3 to 5 (or 8) lines long; flowers solitary in the upper axils, mostly sessile or subsessile; calyx 4 to 5 lines long, the lanceolate or acerose teeth about ½ as long as the puberulent tube; corolla white, whitish-lavender or lilac, 7 to 11 lines long, its lobes obovate, ½ to ⅔ length of tube; stamens unequal, included, the filaments shorter than the anthers; style shorter than calyx.

Rocky ledges or granite sand slopes, 4700 to 10,300 feet: northern Ventura Co.; Sierra Nevada from Tulare Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges from the Yollo Bolly Mts. to western Siskiyou Co. East to the Rocky Mts., north to British Columbia. June-Sept.

Tax. note.—Various collections from Oregon, Idaho, Washington and British Columbia, referred by American and European botanists to Phlox douglasii, agree with the original diagnosis and the plate in Hooker, Flora Boreali-Americana (2:73, t. 158), save that in all collections examined the calyx-teeth equal the calyx-tube or are slightly shorter or slightly longer; whereas in the illustration of the type (t. 158) the calyx-teeth are shown as ⅙ of the length of the calyx-tube. No specimens have been seen which match the type in this particular, but the point is probably one of little more importance than is pubescence of the calyx, which in various northern collections generally exhibits one of the following states: (1) calyx-tube villous or puberulent and the teeth glabrous, (2) calyx-tube and teeth villous or puberulent, or (3) calyx glabrous or nearly so.

Locs.—Northern Ventura Co.: Mt. Piños, *Hoffmann;* Frazier Mt., *Dudley & Lamb* 4562. Sierra Nevada: Alta Peak, Tulare Co., *Steinwand;* Squaw Flat, w. Inyo Co., *M. Kerr* 53; Huntington Lake, Fresno Co., *E. Ferguson* 380; Kaiser Peak, Fresno Co., *A. L. Grant* 1010; Pohono trail, Yosemite, *Wright & Patchett;* Dana Fork, Tuolumne River, *Jepson* 3262; Harden Lake, s. Tuolumne Co., *A. L. Grant* 1277; Hog Ranch (Mather), near Hetch-Hetchy, *A. L. Grant* 993; Sonora Pass, *Jepson* 6574; Keith Dome, Lake Tahoe, *Ottley* 795; Red Hill, Plumas Co., *Follett* 47; Milford, Lassen Co., *M. S. Baker;* Lassen Peak, *Chesnut & Drew;* Goose Lake Valley, Modoc Co., *R. M. Austin;* Mt. Shasta, *Jepson* 14,990. North Coast Ranges: South Yollo Bolly, *Jepson* 14,989; Horse Mt., Humboldt Co., *Tracy* 12,657; Trinity Summit, *Jepson* 2051; Marble Mt., *Chandler* 1662; Klamath Hills, cent. Siskiyou Co., *Butler* 738; Rough-and-Ready trail, Del Norte Co., *R. Van Deventer* 60.

Var. **austromontana** (Cov.) Jepson & Mason. Leaves loosely arranged (relatively remote), usually long (8 to 12 lines) and comparatively broad (1 to 1½ lines at base), the margins usually not recurved or only slightly; calyx-lobes strongly carinate-ribbed; corolla white or bluish.—Montano slopes, 4500 to 7500 feet: San Gabriel Mts. (Blue Ridge, *Peirson* 3179); San Bernardino Mts. (n. slope, *Parish* 3689); San Jacinto Mts. (Hemet Valley, *Munz* 5450); Santa Rosa Mts. (sw. side, in upper Coyote Cañon, *Jepson* 1439); Cuyamaca Mts. (betw. Cuyamaca reservoir and Julian, *C. V. Meyer* 441; Talley's, South Cuyamaca, *K. Brandegee*). South to Lower California, east to Arizona. The calyx is said to be plicate in the sinuses but this character in this group is usually imaginary.

Var. **caespitosa** Mason. Plants closely caespitose, a little moss-like, forming small but extremely dense cushions, the branchlets ¼ to 1 inch high; leaves densely imbricate, 1 to 3 lines long, the margins revolute and thus making rib-like folds on the back which are usually more prominent than the midrib and often obscure it.—Alpine summits, 10,600 to 12,500 feet: southern Sierra Nevada (east side or easterly crests) from Olancha Mt., Tulare Co. (*Hall & Babcock* 5228) and Piute Pass, Tulare Co. (*Ferris* 8883) to Parker Pass, Tuolumne Co. (*A. L. Grant* 1608), Mono Pass (*Jepson* 4463) and Mt. Dana (*Jepson* 3293); White Mts. (Benton, near Foleys, *Shockley* 116). East to the Rocky Mts., north to Washington. For California there is just cited only collections representing the markedly condensed alpine form (Phlox muscoides Nutt.).

Var. **canescens** Mason. Plants compact or cushion-like, 1 to 2 inches high and 2 to 5 inches broad; herbage villous-puberulent or slightly floccose-tomentulose; leaves ½ to 3 lines long, as if 3-ribbed beneath, the midrib prominent and rounded, and the margins revolute-rounded.—Sandy ridges or rocky slopes, 4000 to 8000 feet: southern Sierra Nevada in Kern Co. (Pah Ute Peak, *Purpus* 5341); Modoc Co. (Warner Valley, *Manning* 712; betw. Middle Lake and Lower Lake, e. of Lake City, *Manning*). East to the Rocky Mts., north to Washington. The differentiae relied on between var. canescens and var. caespitosa, as to the Californian representatives, are extremely slight. Moreover they are not constant, so that var. canescens must be regarded as a weak varietal unit.

Var. modocensis Jepson var. n. Stems woody, diffusely branched, 5 to 10 inches high, the internodes long as compared with the species; leaves filiform to narrowly linear, spreading, weak, glabrous, 4 to 8 lines long; pedicels 1 to 5 lines long.—(Planta frutescens, diffusa, 5–10 poll. alta, internodia longiora quam speciei; folia filiformia vel anguste linearia, patentia, debilia, glabra, 4–8 lin. longa; pedicelli 1–5 lin. longi.)—Rocky or dry hill slopes, 3500 to 5500 feet, Modoc Co.: Davis Creek, head of, *Bruce* 2331 (type); Goose Lake, hills e., *R. M. Austin.*

Var. covillei (E. Nels.) Jepson comb. n. Branchlets ¼ to ¾ inch high, forming dense cushions 2 to 8 inches broad; herbage whitish, minutely and thinly villous; leaf-blades oblong to linear, 1½ to 3 lines long, thick, cuspidate, the margins revolute, the dorsal midrib none or obscure; corolla pure white, its limb 8 lines broad, its tube with a lightly pubescent band inside just above the ovary.—Rocky summits, White Mts., 12,300 to 13,500 feet: Sheep Mt., *Jepson* 7325; White Mountain Peak, *Shelton.* On the alpine table lands of the White Mountains between McAfee Meadow and White Mountain Peak, Phlox douglasii var. covillei is one of eight species of seed plants forming the major portion of the turf (see sub Antennaria).

Refs.—PHLOX DOUGLASII Hook., Fl. Bor. Am. 2:73, t. 158 (1838), type loc. "limestone range of the Blue Mts. [of Oregon] and on the Rocky Mts.," *Douglas;* Jepson, Man. 786 (1925). *P. douglasii* subsp. *eu-douglasii* Brand, Pflzr. 4^{250}:85 (1907). *P. diffusa* Benth., Pl. Hartw. 325 (1849), type loc. "Bear Valley, in montibus Sacramento" (that is, Bear Valley, Nevada Co.; cf. Erythea 5:55), *Hartweg* 380. *P. douglasii* var. *diffusa* Gray, Proc. Am. Acad. 8:254 (1870). *P. diffusa* subsp. *subcarinata* Wherry, Jour. Wash. Acad. 29: 517 (1939), type loc. Mt. Rose, Nev., *Heller* 9910a. Var. AUSTROMONTANA Jepson & Mason; Jepson, Man. 786 (1925). *P. austromontana* Cov., Contrib. U.S. Nat. Herb. 4:151 (1893), type loc. Beaverdam Mts., Utah, *Bailey* 1944. *P. austromontana* subsp. *vera* Wherry, Jour. Wash. Acad. 29:518 (1939), based on type of P. austromontana. *P. austromontana* var. *prostrata* E. Nelson, Rev. West. N. Am. Phloxes 19 (1899), type loc. Silver Reef, Utah, *Jones* 5163 y and z. *P. austromontana* subsp. *prostrata* Wherry, l.c. *P. densa* Brand; Engler, Pflzr. 4^{250}:83 (1907), type loc. Frisco, Utah, *Jones* 2021. *P. austromontana* subsp. *densa* Wherry, l.c. 519. Var. CAESPITOSA Mason; Jepson, l.c. 786. *P. caespitosa* Nutt., Jour. Acad. Phila. 7:41, pl. 6, fig. 1 (1834), type loc. Flat-head River, Ida., *Wyeth. P. muscoides* Nutt., Jour. Acad. Phila. 7:42, pl. 6, fig. 2 (1834), "sources of the Missouri River", *Wyeth. P. caespitosa* subsp. *muscoides* Brand, l.c. 84. *P. rigida* Benth.; DC., Prodr. 9:306 (1845), "in montibus coeruleis Americae boreali-occid." [Blue Mts., Ore.], *Douglas. P. caespitosa* var. *rigida* Gray, Proc. Am. Acad. 8:254 (1870). Var. CANESCENS Mason; Jepson, l.c. 786. *P. canescens* T. & G., Pac. R. Rep 2^2:122, pl. 6 (1855), type loc. Cedar Mts., s. of Great Salt Lake, Utah, *Snyder.* Var. MODOCENSIS Jepson. Var. COVILLEI Jepson. *P. covillei* E. Nels., Rev. West. N. Am. Phloxes 15 (1899), type loc. Black Cañon, White Mts., Mono Co., *Coville & Funston* 1801. *P. caespitosa* var. *covillei* Brand; Engler, Pflzr. 4^{250}:84 (1907).

4. **P. stansburyi Hel.** Stems several to many, erect from a woody base, 3 to 12 inches high; herbage puberulent or short-villous, usually glandular, sometimes partially glabrous; leaf-blades linear or linear-lanceolate, thick, ½ to 1½ inches long; flowers in a terminal corymbose cyme; calyx 4 to 5 lines long, the lobes broadly subulate, ⅔ as long as tube; corolla pink or white, its tube 7 to 11 lines long (1¼ to 2 times as long as calyx), with a hairy ring at base inside, its lobes broadly obovate, entire or retuse, about half as long as the tube; stamens unequal, the 2 of higher insertion slightly exserted; style longer than calyx, nearly as long as corolla-tube; ovary-cells 1-ovuled.

Gravelly soil in desert ranges, 4000 to 9900 feet: Mohave Desert; Inyo and Mono Cos.; Modoc Co. East to New Mexico, Utah and Wyoming, north to Washington. May-June.

Field note.—Phlox stansburyi often climbs by means of other plants. Long slender almost filiform stems, growing up through Artemisia tridentata bushes, characterize this species in the Virginia Lakes region of Mono County; stems so slender and weak that it is impracticable to disentangle them without breaking. The flowers and rather scanty leaves are at the top of the bushes, two feet above the ground.—F. W. Peirson.

Locs.—Eastern Mohave Desert: New York Mts., *Jepson* 5490; Cedar Cañon, Mid Hills, Providence Mts., *Jepson* 18,340. Inyo Co.: Grapevine Mts., *Jepson* 19,826; Wild Rose Cañon, Panamint Mts., *Peirson* 9904; Millspaugh, Argus Range; Nelson Range; Convict Creek, *Renner* 9. Mono Co.: Long Valley, *Almeda Nordyke;* Leevining Cañon, *Ottley* 1082. Modoc Co.: Forestdale, *M. S. Baker.*

Note on variation.—Phlox stansburyi is a variable species in the matter of habit, size of corolla and relative length of corolla and calyx. A considerable range of variation may even appear in one collection; it may sometimes appear, as to the flower, in a single individual. These variables are markedly reflected in its low compact var. brevifolia, into which it insensibly passes. In var. brevifolia the corolla-tube slightly exceeds the calyx or varies to twice as long. The style varies in length from 1 to 1¾ times as long as the calyx. Usually the style varies with the corolla, but sometimes the style varies independently of variation in the corolla.

Var. **brevifolia** E. Nels. Plants lower (2 to 4 inches high), compact; herbage glandular-villous with very short but unequal spreading hairs; leaf-blades shorter, broader, thicker, with more marked cartilaginous margin and longer spinescent tip.—Transmontane in the eastern Mohave Desert and in Inyo Co., thence north to eastern Sierra Co. and Lassen Co. East to New Mexico and Utah. As fairly typical may be cited: Barnwell, New York Mts., *K. Brandegee;* Bishop Creek, w. Inyo Co.; Sierra Valley, *Lemmon* 195; Susanville, *T. Brandegee;* Madeline Plains, Lassen Co., *Bruce* 2332.

Var. **hirsuta** (E. Nels.) Jepson comb. n. Stems many, rather densely tufted on the branched root-crown, 1½ to 2½ inches high; herbage with two kinds of spreading hairs, extremely short gland-tipped hairs which pass into less glandular or non-glandular long pilose hairs; leaf-blades narrowly oblong to lanceolate, acute, 3 to 6 lines long; calyx villous, nearly equaling corolla-tube to ⅞ as long, its lobes subulate, somewhat spreading, about as long as the tube; corolla-tube 6 lines long, its lobes about half as long; style ⅔ length of the calyx.—Dry hills, 3500 to 4000 feet, central Siskiyou Co. This plant is but slightly known and satisfactory evaluation waits on fuller collections. In habit and in essential particulars, excepting to some extent in degree, it is similar to var. brevifolia save only in style length. The stems are more densely leafy, the calyx is more villous in var. hirsuta than in var. brevifolia. The herbage in var. brevifolia is usually less villous than in var. hirsuta, but sometimes equally villous. The length of the style, which is about ⅔ the length of calyx, appears to be a constant character, but the weight given this character must be judged in the light of its near relative, var. brevifolia, in which the style varies from the same length as the calyx to nearly twice as long. Var. hirsuta belongs, too, to the same phytogeographic area in California and western Nevada as var. brevifolia. On these accounts the probable invalidity of var. hirsuta as a species is emphasized by its highly localized occurrence at Yreka, whence only two or three collections, one being *Butler* 739.

Refs.—PHLOX STANSBURYI Hel., Bull. Torr. Club. 24:478 (1897). *P. speciosa* var. *stansburyi* Torr., Bot. Mex. Bound. 145 (1859), type loc. gravelly hills near the Organ Mts., N. Mex., *Bigelow. P. longifolia* var. *stansburyi* Gray, Proc. Am. Acad. 8:255 (1870). *P. stansburyi* subsp. *eu-stansburyi* Brand; Engler, Pflzr. 4^{250}:66 (1907), type loc. Lassen Co., *Baker. P. viscida* E. Nels., Rev. West. N. Am. Phloxes 24 (1899), type loc. Blue Mts., Columbia Co., Wash., *Piper;* herbage, pedicels and calyx viscid-pubescent (ex char.).—This form occurs in Modoc Co. *P. stansburyi* subsp. *compacta* var. *viscida* Brand, l.c. 67. *P. dolichantha* Jepson, Man. 785 (1925); not Gray. Var. BREVIFOLIA E. Nels., l.c. 27 (1899). *P. longifolia* var. *stansburyi* f. *brevifolia* Gray, Proc. Am. Acad. 8:255 (1870), "Chiefly in the southern districts [presumably Utah and Nevada] and extending into New Mexico and Arizona." *P. grayi* Wooton & Standley, Contrib. U. S. Nat. Herb. 16:161 (1913), based on the preceding. *P. longifolia* var. *stansburyi* subvar. *brevifolia* Wats., Bot. King 261 (1871). Var. HIRSUTA Jepson. *P. hirsuta* E. Nels., Rev. West. N. Am. Phloxes 28 (1899), type loc. Yreka, *Greene* 719; Jepson, Man. 786 (1925).

5. **P. dolichantha** Gray. Stems erect or ascending, 3 to 10 inches high; herbage minutely villous (and often glandular) or glabrate, the inflorescence glandular-pubescent; leaf-blades linear-lanceolate to lanceolate, often falcate, ½ to 1½ inches long; flowers in a terminal compact several-flowered cyme, the pedicels 1 to 5 lines long; calyx ⅓ to ¼ as long as the corolla, the lobes equaling or shorter than the calyx-tube; corolla whitish or rose-purple, glabrous, 1 to 1¼ inches long, 3 to 4 times longer than the calyx, its lobes obovate; stamens unequally inserted, the 2 of higher insertion (or occasionally all) somewhat exserted; style equaling the corolla-tube or slightly exceeding it.

Montane slopes, 4000 to 6500 feet: Siskiyou Co.; Mono and Inyo Cos. East to southern Nevada. June-July.

Locs.—Castle Lake road, Siskiyou Co., *Cooke* 15,049; near Benton, Mono Co., *Shockley* 124; Westgard Pass, n. end Inyo Mts., *Ferris & Bacigalupi* 8054.

Var. **bernardina** (M. & J.) Jepson comb. n. Less puberulent; corolla 1 to 2 inches long, the limb 6 to 9 lines broad; calyx 5 to 6 lines long.—San Bernardino Mts. (Bear Valley, *Parish* 3686). Perhaps the differences are too slight to sustain even varietal rank.

Refs.—PHLOX DOLICHANTHA Gray, Proc. Am. Acad. 22:310 (1886), type loc. Pahranagat Mts., se. Nev., *Searls. P. superba* Brand; Engler, Pflzr. 4^{250}:67 (1907), type loc. Tonopah, Nev., *Hugh Brown;* Jepson, Man. 785 (1925). *P. longituba* Hel., Muhl. 2:228 (1905), type loc. foothills w. of Bishop, Inyo Co., *Heller* 8320. Var. BERNARDINA Jepson. *P. bernardina* M. & J., Bull. Torr. Club 49:356 (1922), type loc. Bear Valley, San Bernardino Mts., *Parish* 1818 (typ. vidi).

3. LEPTODACTYLON H. & A.

Undershrubs, commonly tufted and very leafy. Leaves alternate or some exceptionally opposite, much fascicled in the axils, palmately 3 to 9-parted, pungent.

Flowers showy, pink, lilac, white or yellowish, fragrant, borne in few-flowered terminal clusters or solitary. Calyx membranous to the base below the sinuses. Corolla salverform or with funnelform throat, the tube commonly exceeding the calyx. Stamens short, inserted in or below the throat. Seeds unchanged under water.—Species 2. (Greek leptos, narrow, and dactylon, finger, in reference to the palmately parted leaves.)

Leaves mostly persistent for 2 or more seasons; corolla tubular-funnelform, the tube and throat 1½ to 2 times as long as the lobes; stamens inserted in throat..........................1. *L. pungens.*

Leaves mostly deciduous after first season; corolla strictly salverform, the tube equaling or shorter than the lobes; stamens inserted above middle of corolla-tube..............2. *L. californicum.*

1. **L. pungens** (Torr.) Jepson. Granite Gilia. (Fig. 373.) Small bush 3 to 8 inches high, the stems several to many, branching, arising from a branched woody base, densely clothed with leaves to top, Phlox-like and often forming a broad rough mat; stems of the season puberulent to densely villous and frequently also glandular, in age shedding the pallid epidermis and becoming dark and rough; leaves persistent for 2 or 3 seasons, prevalently alternate but the lower ones occasionally opposite, sessile, palmately or somewhat pinnately divided into 3 or 5 (or 7) acerose lobes, 1 to 7 lines long, with shorter leaves in the axils; leaf-lobes subequal to strongly unequal, the terminal lobe usually longest; flowers sessile, terminal or solitary in the upper axils, or congested into a few-flowered cluster; calyx hyaline between the ribs, its lobes unequal, ⅕ to ⅓ as long as the tube; corolla tubular-funnelform, white or pink, 9 to 11 lines long, the tube 1½ to 2 times as long as the calyx; stamens equal, the anthers almost sessile, inserted on the corolla-throat, included; capsule oblong, the cells many-seeded; style very short, only a little longer than the capsule.

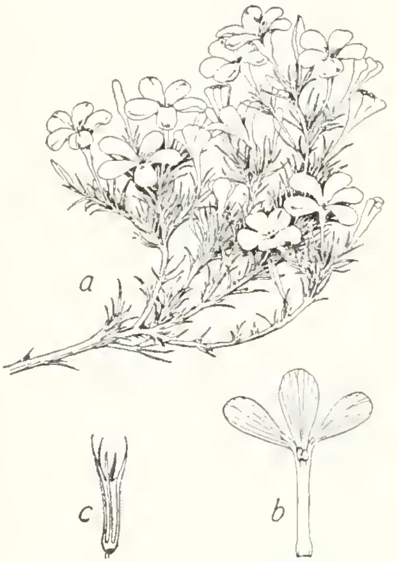

Fig. 373. Leptodactylon pungens Jepson. *a*, fl. branchlet, × ½; *b*, long. sect. of corolla, × 1; *c*, calyx, × 1½.

Dry gravelly or rocky places, mostly on granite, 4000 to 12,000 feet: mountains of cismontane and intramontane Southern California; west slope Sierra Nevada from Kern Co. to Siskiyou Co.; east side Sierra Nevada from Inyo Co. to Modoc Co. South to Lower California, east to New Mexico, Colorado and Montana, north to eastern Washington. May-Aug.

Field note.—M. E. Jones writes of the flowers as nocturnal (Zoe 5:41); it is certain that diurnally the corolla remains closed in dull weather. The corolla-lobes are often reddish-purple on the portion exposed in the bud; even when fully expanded, the obovate lobes are somewhat overlapping.

Locs.—Cismontane and intramontane S. Cal.: Toro Peak, Santa Rosa Mts., *Munz* 5874; Tahquitz Peak, San Jacinto Mts., *Carl Meyer* 611; Bear Valley, San Bernardino Mts., *Parish* 3683; Holcomb Creek, San Bernardino Mts., *Peirson* 3348; Fish Creek, San Bernardino Mts., *J. Grinnell* 21; Mt. San Antonio; Ontario Ridge, San Gabriel Mts., *Peirson* 152; Mt. Piños, n. Ventura Co., *J. Grinnell* 25. Sierra Nevada: Piute Peak, Kern Co., *Purpus* 5505; Mt. Whitney, *Burton & Ryerson* 27; Kearsage Pinnacles, *Jepson* 856a; Kaiser Peak, *A. L. Grant* 1433; Piute Creek, Fresno Co., *E. Ferguson* 449; Silver Pass, Fresno Co., *A. L. Grant* 1520; Snow Creek, Yosemite, *Jepson* 10,495; Lake Merced, Mariposa Co., *Jepson* 4419; Lambert Dome, upper Tuolumne River, *Jepson* 3247; Conness Creek, Tuolumne Cañon, *Jepson* 3364; Angora Ridge near Lake Tahoe, *Ottley* 859; Colby, Butte Co., *R. M. Austin;* lava beds, ne. Shasta Co., *Hall & Babcock* 4236; Whitney Creek, Mt. Shasta, *Peirson* 3809. East slope and east side Sierra Nevada: Little Cottonwood Mdw. (near Horseshoe Mdw.), w. Inyo Co., *Jepson* 923; Bishop (foothills s.), *Heller*

8292; betw. Silver Cañon and Big Prospector Mdw., White Mts., *Jepson* 7246; Mono Mills (near Mono Lake), *Jos. & Hilda Grinnell* 1060a; Grass Valley, Lassen Co., *Fischer & Johnson* 1202; Egg Lake, Modoc Co., *M. S. Baker.*

Var. **hallii** (Parish) Jepson. Low erect shrub 10 to 20 inches high, the stems somewhat virgate; branchlets on the 2 or 3-year-old stems short, bud-like, 4-angled and thus lycopodioid in aspect; leaves usually opposite, palmately 3-parted, the middle lobe 2 to 7 times longer than the lateral ones; corolla white or yellowish, 6 to 10 lines long, the lobes narrowly obovate.—Mountains on northwest and west sides of the Colorado Desert, 2000 to 6000 feet: Piñon Well Cañon, north of Indio, *Jepson* 6003; Coyote Cañon, Santa Rosa Mts., *Jepson* 1456; Mountain Sprs. (summit above), e. San Diego Co., *Jepson* 11,805. Apr.-May.

Var. **shastense** Jepson var. n. Erect shrub, 13 to 16 inches high; branches and branchlets very erect, the somewhat remote leaves all opposite quite to or nearly to the top; corolla white.—(Fruticulus erectus, strictus; folia subremota, plerumque opposita; corolla alba.)—Mayten (e. of), Little Shasta Valley, Siskiyou Co., *Jepson* 19,994 (type).

Var. **subflavidum** Jepson var. n. Shrub 1 to 2 feet high and 2 to 3 feet broad, the shoots of the season puberulent, the leaves alternate, rather remote; leaf-lobes strongly unequal; corolla pale yellow.—(Frutex 1–2 ped. altus, 2–3 ped. latus, caulibus in praesenti anno puberulentibus; folia alterna subremota; foliorum lobi inaequales; corolla subflavida.)—Rocky cañon walls, 4500 to 5500 feet: desert ranges from the eastern Mohave Desert (Fountain Cañon, Providence Mts., *Mary Beal* 665; Bonanza King Cañon, Providence Mts., *Jepson* 18,280), north to Inyo Co. (Leadfield, Grapevine Mts., *Jepson* 19,830, type) and Mono Co. (Long Valley, *Almeda Nordyke*).

Refs.—LEPTODACTYLON PUNGENS Jepson, Man. 806, fig. 779 (1925). *Cantua pungens* Torr., Ann. Lyc. N. Y. 2:221 (1826), type loc. "Valley of the Loup Fork?," Neb., *James. Gilia pungens* Benth.; DC., Prodr. 9:316 (1845). *Phlox hookeri* Dougl.; Hook., Fl. Bor. Am. 2:73, pl. 159 (1838), type loc. near the narrows of the Oakangan and Priest's Rapid of the Columbia River, *Douglas. Cantua pungens* var. *hookeri* Howell, Fl. Nw. Am. 453 (1903). *L. pungens* var. *hookeri* Jepson, Man. 807 (1925). *Gilia pungens* subsp. *eupungens* var. *hookeri* Brand; Engler, Pflzr. 4^{250}:126 (1907). *Gilia pungens* var. *squarrosa* Gray, Proc. Am. Acad. 8:268 (1870), "arid districts of Nevada and Utah," *Anderson, Watson. Cantua pungens* var. *squarrosa* Howell, Fl. Nw. Am. 453 (1903). *L. patens* Hel., Muhl. 1:146 (1906), based on Gilia pungens var. squarrosa Gray. *Gilia tenuiloba* Parish, Erythea 7:95 (1899), type loc. San Jacinto Mts., *Parish* 689 ("probably Tahquitz Valley"). *G. pungens* var. *tenuiloba* Mlkn., Univ. Cal. Publ. Bot. 2:43 (1904). *L. tenuilobum* Hel., Muhl. 1:146 (1906). *L. pungens* var. *tenuilobum* Jepson, Man. 807 (1925). *Gilia pungens* subsp. *pulchriflora* Brand, Ann. Conserv. et Jard. Bot. Genève, 15–16:333 (1913), type loc. Farewell Gap, Tulare Co., *Culbertson. G. jaegeri* Munz, Bull. S. Cal. Acad. 31:68 (1932), type loc. Tahquitz Peak, San Jacinto Mts., *Jaeger.* Var. HALLII Jepson, Man. 807 (1925). *Gilia hallii* Parish, Erythea, 7:94 (1899), type loc. Coyote Cañon, sw. slope of El Toro Mt., Santa Rosa Mts., *Hall. G. pungens* var. *hallii* Mlkn., Univ. Cal. Publ. Bot. 2:42 (1904). *L. hallii* Hel., Muhl. 1:146 (1906). *Gilia pungens* subsp. *hallii* Brand; Engler, Pflzr. 4^{250}:128 (1907). Var. SHASTENSE Jepson. Var. SUBFLAVIDUM Jepson.

2. **L. californicum** H. & A. PRICKLY GILIA. Erect shrub (or at least woody below), 1 to 5 feet high, the branches thickly clothed with spiny foliage; stems and calyces puberulent; leaves usually glabrous or glabrate, mostly deciduous, alternate or occasionally opposite, especially below, 1 to 3½ lines long, palmately 5 to 9-divided into rigid narrowly linear acerose lobes; flowers sessile, solitary in the closely approximate upper axils, thus congested into few-flowered clusters; calyx ⅔ to as long as corolla-tube, its subulate lobes pungent, equal or nearly equal, ⅓ to ½ as long as calyx-tube, the hyaline intervals broad; corolla salverform, bright rose-color or pink, 7 to 9 lines long, 9 to 17 lines wide, its broadly obovate lobes equaling or slightly exceeding the tube; stamens included, inserted above the middle of the tube, the filaments very short; capsule elongated, the cells many-seeded; style rather short, included.

Chaparral slopes or borders of washes, 600 to 5000 feet: in the outer and middle ranges of San Luis Obispo Co.; coastal Southern California from Santa Barbara Co. to Orange Co. Feb.-May.

Field note.—From the standpoint of its ecological interest and its showiness in flower, Leptodactylon californicum is one of the more remarkable plants of the Californian flora. Commonly a member of the chaparral or chamise formations on the driest or most sterile slopes, its salverform corollas and prickly foliage at once attract the attention of the traveler. In the cañons of the Purisima Hills, for example, the shrubs, 3 to 5 feet high, are covered in April with large clusters of satiny flowers of a rose pink or Godetia hue which glorify the open slopes and form an enlivening contrast to the dull tone of the chamise formation.

Leptodactylon californicum is distributed nearly throughout the coastal phytogeographic area from San Luis Obispo Co. to Orange Co. and western Riverside Co. It is of especial interest that on no one of the Santa Barbara Islands has it as yet been discovered—or at least recorded. It has been attributed to Monterey (Bot. Cal. 1:492) and may yet be found in southern Monterey Co.

Locs.—Price Cañon, near San Luis Obispo, *K. Brandegee;* upper Salinas River bridge, 12 mi. w. of Pozo, *Jepson* 11,983; Arroyo Grande, *Alice King;* Purisima Hills, near Lompoc, *Jepson* 11,948; Santa Barbara, *Jepson* 9157; Ojai Valley, *Thacher* 35; Simi Valley, Ventura Co., *Jepson* 8454; Saugus, Santa Clara River, *Davy;* Topanga Cañon, Santa Monica Mts., *Jepson* 19,117; Mt. Gleason, San Gabriel Mts., *Peirson* 401; Icehouse Cañon, San Antonio Mts., *Parish* 11,951; San Bernardino foothills, *Parish;* Reche Cañon, e. of Riverside, *Parish;* Santa Ana, *Alice King.*

Var. **glandulosum** Abrams. Plants very stout; stems, leaves and calyces densely glandular-pubescent.—Coastal region of Los Angeles Co.: Santa Monica Mts., *J. C. Nevin;* Brush Cañon near Cahuenga Peak, *Chandler* 2002; Los Angeles, *Merritt;* Echo Mt., *Peirson* 158.

Refs.—LEPTODACTYLON CALIFORNICUM H. & A., Bot. Beech. 369, pl. 89 (1840), type from Cal., *Douglas;* Jepson, Man. 807 (1925). *Gilia californica* Benth.; DC., Prodr. 9:316 (1845). Var. GLANDULOSUM Abrams, Bull. N. Y. Bot. Gard. 6:438 (1910). *Gilia californica* var. *glandulosa* Eastw., Bot. Gaz. 37:447 (1904), type loc. "Pasadena" (Mt. Wilson), *F. Grinnell Jr.*

4. NAVARRETIA R. & P.

Small annuals with mostly rigid stems. Leaves alternate, once or twice pinnately divided or pinnatifid or the lowest sometimes entire or subentire, the segments mostly rigid, subulate to lanceolate or acicular, cuspidate or spinose. Lobes or teeth of bracts and calyx spiny or cuspidate. Calyx not accrescent, its teeth or lobes mostly unequal, toothed or spiny or entire, its tube scarious between the 5 angles or ribs. Corolla tubular-funnelform or salverform, blue, white or yellow. Stamens exserted or included, the filaments inserted in the corolla-throat; anthers oval (oblong in N. viscidula). Capsule commonly 3-celled and 3-valved, or in a few species 1-celled and 4-valved, or circumscissile or indehiscent.—Species 34 in western North America, 1 in South America. (Fr. Ferd. Navarrete, a Spanish physician.)

Flower and fruit in Navarretia.—All the species of Navarretia exhibit a marked similarity of habit, foliage, inflorescence and flowers, so much so that many species, as here set down, are difficult, in the absence of constant technical characters, to recognize unless in their most marked phases.

Several species, however, show strong departures in flower and fruit characters from the main generic pattern or even from the prevailing ordinal character. In Navarretia cotulaefolia and N. bowmanae the flower is usually 4-merous, instead of 5-merous as prevailing in the family generally. In Navarretia cotulaefolia the style has 2 stigmas and the ovary is 2-celled with a single ovule in each cell. During development one ovule is crowded upwards so that the two ovules do not lie side by side, but somewhat obliquely. As the capsule grows the partition disappears and the 1-celled capsule usually contains only one seed. Since the ovary is 2-celled a 2-valved capsule would be expected, but each valve splits along the median line from below making four valves. Such 4-valved capsules characterize also Navarretia pubescens, N. mitracarpa and N. filicaulis, whereas the capsule is 3-valved in the family generally. In Navarretia nigellaeformis, N. bowmanae, N. pubescens and N. jepsonii the capsule is 1-celled or usually so, or sometimes imperfectly 2-celled. Yet again, in Navarretia intertexta, N. leucocephala and N. prostrata the capsule is indehiscent (with the seeds agglutinated in a mass) or with the thin walls breaking down irregularly. In Navarretia setiloba the capsule is circumscissile. The style, typically 3-cleft, is in some species 2-cleft as in Navarretia intertexta and N. setiloba, or quite entire as usually in Navarretia leucocephala, N. minima and N. filicaulis.

A remarkable peculiarity sometimes characterizes the embryo. While investigating embryos in Polemoniaceae in 1896 the writer discovered that the embryo in Navarretia pubescens is furnished with apparently six cotyledons instead of two. In reality there are two, each so deeply cleft into 3 lobes as to appear like 3 cotyledons, although in one instance (Calistoga, *Beardsley*) the embryo showed 3 cotyledons, each 2-cleft. The peculiar 3-divided cotyledons were described in this author's Flora of Western Middle California (1901), a description cited by A. Brand in connection with further accounts of the matter in Engler's Botanische Jahrbücher (36:77,—1905). Since that time similar cotyledons (deeply cleft into 3 lobes) have been demonstrated in the embryo of Navarretia mitracarpa. The embryo in Navarretia setiloba is also very unusual. It has 3 cotyledons which are slightly unequal and so deeply cleft as to give somewhat the appearance of 6 cotyledons.

Toothing of leaf-segments or character of the segments are features reflected sometimes in the calyx-lobes. In a single individual of Navarretia cotulaefolia calyces have been observed to vary as follows: (1) lobes or segments 4 or 5, short, subequal, entire; (2) lobes similar to 1, but more unequal; (3) lobes unequal, 1 long and toothed, 4 shorter and entire; (4) similar to 3, but two of the lobes toothed, one of these often with approximate and divergent teeth at base; (5) usually 3 of the lobes toothed, one of these much toothed and sometimes bipinnatifid. This last form, a bipinnatifid segment, is similar to the smaller and shorter bractlets which subtend the flower; and these inner bractlets pass by every gradation in size and decrease of segmentation into the bracts which subtend the heads and into the upper leaves. This series then represents a sort of repetition of the character of the leaf in the calyx and is noticed in various species in this genus. The leaf-segments and calyx-lobes in Navarretia squarrosa are very similar or recall features one of the other, as also in N. atractyloides. In nearly all the calyx variations of N. cotulaefolia cited above there are likely to be only four calyx-lobes instead of five, the corolla being concurrently tetramerous.

Superficial characters used in differentiating Navarretia species are often inconstant or unsatisfactory, but in some cases such differentiae may be strengthened by attention to the anatomy or a more rigid analysis of floral or carpological organs, even to the kind of variation in an organ and its degree of variation.

A. Capsule not regularly dehiscent, the walls thin and transparent and closely covering the seeds which are agglutinated into a mass; seeds favosely pitted; flowers white or pale blue.

1. Style 2-cleft or entire; stamens exserted.

Heads surrounded by foliaceous bracts (usually much reduced in no. 2); calyces glabrous (or rarely thinly puberulent) but with a ring of hairs on the inside of tube just below the sinuses; stamens inserted about middle of corolla-throat; style not cleft or slightly 2-cleft.

Stems erect or spreading (low and much-branched in no. 2); calyx usually glabrous outside.

Heads ½ to 1 inch across, the outer foliaceous bracts conspicuously exceeding the heads; calyx-lobes entire, shorter than the corolla; Great Valley and North Coast Ranges..........1. *N. leucocephala.*

Heads small (3 to 6 lines across), dense, the bracts scarcely or not at all exceeding the heads; calyx-lobes entire or bifid or trifid, about as long as or slightly exceeding the corolla; n. Sierra Nevada and North Coast Ranges..........2. *N. minima.*

Main stem short so that the primary flower cluster is seated on the ground, the branches radiating from beneath it and prostrate; calyx puberulent outside, its lobes entire or 2 of them bifid or trifid; Monterey Co. to coastal S. Cal..........3. *N. prostrata.*

Heads subtended by rigidly acerose-toothed bracts, these and calyces densely white-tomentose (or becoming glabrate in var. propinqua); stamens inserted near base of corolla-throat; style 2-cleft; widely distributed..........4. *N. intertexta.*

2. Style 3-cleft.

Stamens exserted, inserted on base of corolla-throat; bracts and calyces pubescent; widely distributed..........5. *N. tagetina.*

Stamens included, inserted about middle of corolla-throat on very short filaments; bracts and calyces nearly glabrous, the margins of the bracts ciliate and the calyx with a ring of hairs on the throat just below sinuses; n. Cal., rare..........6. *N. subuligera.*

B. Capsule regularly dehiscent by valves and releasing the seeds which are free from each other.

1. Capsule 1-celled (sometimes imperfectly 2-celled); stamens exserted; style 2-cleft (or sometimes entire).

Capsule dehiscent from the base, 4 (or 8)-valved; leaves and bracts bipinnatifid, sometimes with an oblanceolate spatulate-dilated terminal segment.

Stamens inserted about middle of corolla-throat.

Capsule 4 to 8-seeded; flowers 5-merous; corolla yellow with 5 dark purple spots in the throat; Sierra Nevada foothills, Great Valley and South Coast Ranges..........7. *N. nigellaeformis.*

Capsule 1 or 2-seeded; flowers 4 or 5-merous.

Heads villous and commonly minutely glandular, the body of the bracts and the calyx-tubes glabrous or nearly so; corolla creamy or dull white; Coast Ranges and Sacramento Valley..........8. *N. cotulaefolia.*

Heads white-tomentose or densely white-villous; corolla blue, the throat white with a purple spot at the base of each lobe; n. Cal..........9. *N. bowmanae.*

Stamens inserted on or near base of corolla-throat; capsule 1 or 2-seeded; corolla blue or purple.

Bracts and calyces glandular-pubescent, some of the leaves and bracts with the terminal segment oblanceolate to spatulate-dilated, the margin cut into upwardly pointed laciniae; capsules about 1½ lines long, 4-valved; cotyledons deeply cleft into 3 lobes, seeming as if 6 cotyledons.

Capsule 1 or 2-seeded, rounded at the apex; corolla-throat ⅔ to as long as corolla-tube; cent. and n. Cal..........10. *N. pubescens.*

Capsule 1-seeded, 4-angled at apex; corolla-throat ⅔ as long as corolla-tube; South Coast Ranges and Lake Co..........11. *N. mitracarpa.*

Bracts and calyces hairy, not glandular; capsules about 1 line long, 8-nerved at base and 8-valvate at base; cotyledons entire; Lake and Colusa Cos..........12. *N. jepsonii.*

Capsule not dehiscent from the base; stamens inserted on base of corolla-throat; corolla blue or purple.

Capsule circumscissile, the top lifting like a lid from the single oblong seed; leaves and outer bracts bipinnatifid with a conspicuous ovate-lanceolate terminal segment; Sierra Nevada in Kern Co..........13. *N. setiloba.*

Capsule 4-valved, dehiscent from the apex, 4 to 8-seeded; leaves filiform, the lower ones pinnate with filiform segments; stamens long-exserted; Sierra Nevada foothills..........14. *N. filicaulis.*

2. Capsule 3-celled, 3-valved; styles 3-cleft; stamens included or only shortly exserted.

Anthers oval or elliptic, small (less than ½ line long).

Leaves filiform, entire or with 1 to several pairs of filiform lobes mostly near the base.

Bracts palmately 3 to 5-cleft, these and calyces white-tomentose, not glandular.

Corolla yellow or purple, about 1½ times as long as calyx; stamens shortly exserted; Sierra Nevada foothills..........15. *N. prolifera.*

Corolla purple or pinkish, nearly as long as the calyx; stamens included; Sierra Nevada and North Coast Ranges..........16. *N. divaricata.*

Bracts pinnately divided, the lobes mostly bi- or tri-partite into acicular subulate divisions, these and calyces glandular-puberulent; corolla yellow; stamens shortly exserted; Sierra Nevada (e. side or easterly summits)..........17. *N. breweri.*

Leaves (at least the upper) commonly with rachis relatively broad (½ to 4 lines wide).

Leaves pinnately parted, some of them with the divisions incised or parted; stamens included.

Corolla 5 to 6 lines long; stamens unequally inserted about middle of corolla-tube, the longer filaments ½ to 1 line long; Coast Ranges and n. Sierra Nevada foothills..........18. *N. squarrosa.*

Corolla 2½ to 3 lines long; stamens inserted below middle of corolla-tube, the filaments less than ⅓ line long; Coast Ranges..........19. *N. mellita.*

Leaves merely pinnatifid or incised.

Bracts mostly ovate, coriaceous, laciniate-toothed towards the base, abruptly acerose-pointed at the tip; corolla 5 lines long; mostly erect slender plants; cent. Coast Ranges..........20. *N. heterodoxa.*

Bracts and leaves ovate to oblong-lanceolate or linear, coriaceous, very spiny-pinnatifid; corolla 7 to 9 lines long; mostly spreading very coarse plants; Coast Ranges, San Joaquin Valley and coastal S. Cal...21. *N. atractyloides.*

Anthers oblong to linear-oblong; rachis of the leaves filiform or the upper leaves with broadened rachis; leaves and bracts pinnatifid; stamens shortly exserted; cent. and n. Cal..........22. *N. viscidula.*

1. **N. leucocephala** Benth. (Fig. 374.) Stem simple or branching from the base, 3 to 5 inches high, the heads terminal on the stem or main branches, usually with secondary branches proliferous from beneath them; herbage puberulent or the leaves glabrate; leaves ⅓ to 2 inches long, pinnately parted, the divisions filiform, mostly remote, entire or sparingly lobed, the rachis broad and often prolonged into an elongated terminal entire division; heads dense, ½ to 1 inch broad, the outer foliaceous bracts conspicuously exceeding the heads; bracts glabrous but the margins ciliate; body of bracts narrow-ovate or oblong, spinosely margined, the spines sometimes forked, sometimes arising from the back of the body of the bract; calyx glabrous or sometimes scantily puberulent, always with a ring of hairs at the base of the calyx-lobes inside, the teeth mostly entire and nearly equal, shorter than corolla; corolla clear white, 2 to 4 lines long; stamens inserted at about middle of corolla-throat; style not cleft or only slightly; capsule 2 or 4 to 8-seeded.

Clay depressions, often in alkaline soil, on valley floors or plains and beds of former winter pools, often forming dense colonies in hog wallows, 10 to 1500 feet: North Coast Ranges from Sonoma and Napa Cos. to Humboldt Co.; Great Valley from Fresno Co. to Shasta Co. North to southern Oregon. Apr.-May.

Note on the flower and fruit.—The capsule in Navarretia leucocephala is not regularly dehiscent. Instead the walls gradually break down in an irregular manner, a process hastened by late May or June rains. The reddish-brown seeds with their foveolate surface are thus released, but held in the head by means of the dense ranks of spiny bract-segments and calyx-lobes, which form a sort of basket. In consequence, the seeds are only gradually dispersed by air movement or casual agency. Individuals sometimes show 6-merous corollas. Rarely the corolla is lilac in a colony where white corollas are equally prevalent.

The primary or initial head is terminal on a main axis which is, in some ecological forms, only ¼ to ½ or 1 inch high. When in such case the axis is very short, from beneath this terminal head are developed proliferous branches, all bearing in turn terminal heads. This ecological habit-form is often characteristic of seasons of scant rainfall and frequently establishes a thin closely hugging carpet on sunbaked beds of former winter pools in the Great Valley.

Locs.—North Coast Ranges: Windsor, Sonoma Co., *Jepson* 9302; Calistoga, *Tracy* 1853; Lower Lake, Lake Co., *H. A. Dutton;* Little Lake Valley, Mendocino Co., *Tracy* 14,051; Round Valley, ne. Mendocino Co., *Tracy* 15,758; betw. Middle and North Yager creeks, Humboldt Co., *Tracy* 8476. Great Valley: Fresno, *Eisen;* Madera (8 mi. n.), *Hoover* 1253; Athlone, Merced Co., *Hoover* 608; Barfield School, e. of Turlock, *Jepson* 10,696; Modesto (10 mi. w.), *Hoover* 580; Burnett sta., 2 mi. nw. of Oakdale, *Jepson* 15,018; Clements, ne. San Joaquin Co., Jepson 1823d; Vacaville, *Jepson* 6797; Mills sta., ne. Sacramento Co., *Jepson* 15,731; Rio Linda, n. of Sacramento, *Jepson* 16,570; Roseville, Placer Co., *R. E. Arp;* Willows, Glenn Co., *Jepson* 15,019; Chico, *Palmer* 2081; Pine Creek, s. of Vina, Tehama Co., *Heller* 11,337; Anderson, Shasta Co., *Alice King;* Redding, *C. F. Rose.*

Refs.—NAVARRETIA LEUCOCEPHALA Benth., Pl. Hartw. 324 (1849), type loc. "Sacramento Valley," *Hartweg* 247 (more specifically, plains near Feather River; cf. Erythea 5:55); Jepson, Man. 788, fig. 769 (1925). *Gilia leucocephala* Gray, Proc. Am. Acad. 8:270 (1870); Jepson, Fl. W. Mid. Cal. 427 (1901), ed. 2, 332 (1911).

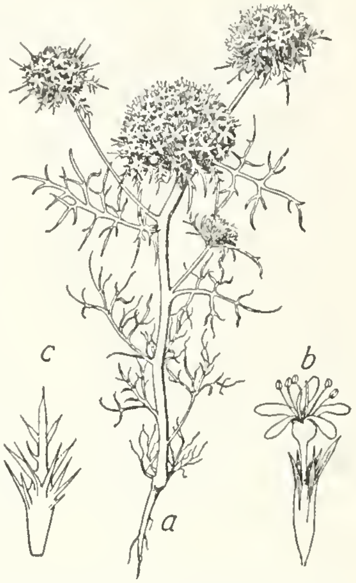

Fig. 374. NAVARRETIA LEUCOCEPHALA Benth. *a*, habit, × ½; *b*, fl., × 2½; *c*, bract, × 2½.

2. **N. minima** Nutt. Stem branched from the base, ½ to 3½ inches high, the heads terminal, many, especially in relation to the size of the plant, and commonly crowded; herbage scantily puberulent or subglabrous; leaves ½ to 1¼ inches long, pinnately divided into 3 to 5 remote pairs of short linear-subulate segments, or the segments reduced to 1 or 2 pairs set near the base of the linear-filiform rachis, or the lower leaves sometimes entire; petioles very short or almost none; bracts similar to the leaves, the lower part or body ciliate and sometimes puberulent on the back; heads small (3 to 6 lines broad), dense, evenly rounded, that is, the bracts and flowers subequal, or only a few bracts (especially the outer) exceeding the heads; calyx perfectly glabrous outside (rarely partially hairy), its teeth short, broad, entire or some bifid or trifid, often divergent, about ½ as long as the tube; sinuses of calyx densely short-hairy; corolla white, 2½ to 3 lines long, shorter than or little exceeding the calyx; stamens exserted, the filaments inserted a little below middle of corolla-throat; style not cleft or very shortly 2-cleft; capsule 1 to 8-seeded.

Moist places (overflowed in winter or spring) or margins of ponds: northern Sierra Nevada, 3400 to 6100 feet, from Nevada Co. to Lassen and Shasta Cos.; North Coast Ranges, 750 to 5000 feet, from Mendocino Co. to Humboldt Co. East to Nebraska, north to Washington. July-Aug.

Tax. note.—In most respects Navarretia minima may be viewed as a dwarfed form of N. leucocephala with many small heads and with short corollas. On technical grounds it has some claims to rank as a variety of N. leucocephala.

Locs.—Northern Sierra Nevada: Donner Lake, *Sonne* 233; Truckee, *Sonne;* Sierra Valley, *Jepson* 8053; Eagle Lake, Lassen Co., *Baker & Nutting;* Tamarack road at Johnson ranch, ne. Shasta Co., *M. S. Baker;* upper Fall River Valley, ne. Shasta Co., *Jepson* 5752. North Coast Ranges: Sherwood Valley, Mendocino Co., *Davy* 5162; Miranda, South Fork Eel River, *Jepson* 12,366; Trinity Summit, *Manning* 99.

Refs.—NAVARRETIA MINIMA Nutt., Jour. Acad. Phila. n. s. 1:160 (1848), type loc. "plains of the Oregon [Columbia River] near Walla-Walla," *Nuttall;* Jepson, Man. 791 (1925). *Gilia minima* Gray, Proc. Am. Acad. 8:269 (1870).

3. **N. prostrata** Greene. Plants prostrate; primary flower-cluster or head sessile at the ground, the branches radiating from beneath it 1 to 3 inches long, simple or rarely once forked, terminating in dense heads; herbage glabrous; leaves pinnatifid, 3/4 to 2 inches long, the rachis broad and elongated, the segments remote; outer bracts foliaceous, conspicuous (3/4 to 1 3/4 inches long), 2 to 5 times as long as the heads; inner bracts mostly trifid at apex, chartaceous below, not exceeding the corolla; calyx pubescent outside (sometimes only scantily puberulent), a ring of hairs at the base of the calyx-lobes inside, the lobes unequal, the 2 longer tridentate; corolla white or pale lavender, 3½ lines long; calyx-teeth in fruit contracted over the capsule; capsule 2-celled, 9 to 11-seeded, the seeds small, agglutinated in a mass as in N. intertexta and N. leucocephala.

Mesas and valleys, 50 to 1500 feet: Monterey Co.; cismontane Southern California. May.

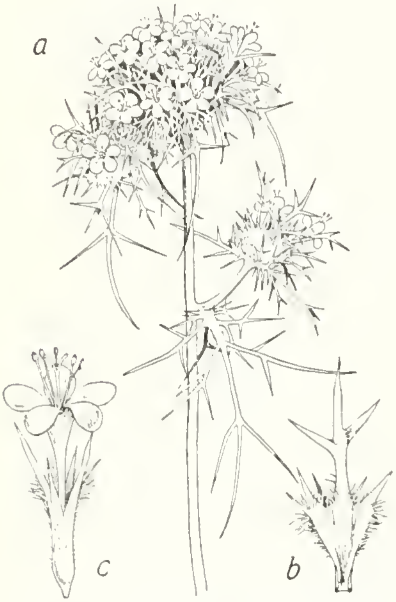

Fig. 375. NAVARRETIA INTERTEXTA Hook. *a*, fl. branch, × 1; *b*, bract, × 2½; *c*, fl., × 2½.

Biol. note.—When individuals of certain native annual species precociously develop a single flower or a single flower-cluster as a sessile or subsessile inflorescence seated in a leaf rosette on the ground, such a phenomenon is usually regarded as an adaptation to arid or semiarid habitats of precarious or intermittent rainfall. If continued moisture fail, such a development represents the entire effort of the plant; by this adventure the flower or flower-cluster matures some seed. On the other hand if there be renewed or continued precipitation under favorable conditions for growth, the plant will produce a wheel of proliferating branches from beneath the initial sessile flower or sessile flower-cluster. Such proliferating branches are usually abundantly floriferous. This sort of ecological adaptation is called prophalism (Jepson, Man. 19). Examples of prophalophytes are Oenothera trichocalyx and Navarretia prostrata.

Typically, Navarretia prostrata is most characteristic of the coast valleys of Southern California. Occasionally there is in a colony partial departure from the usual form. For example, at such a station as National City, the abbreviated main axis may elongate an inch or two, thus lifting the primary head off the ground and spacing the lateral secondary radiating branches. In other words this is just the habit simulating that not infrequently found in Navarretia leucocephala of the Great Valley when the reverse conditions occur, that is, when the primary axis in certain individuals of a colony shortens markedly and the lateral branches much exceed it in length (Madera, 8 mi. n. of, *Hoover* 1253; Modesto, 10 mi. w. of, *Hoover* 580; Mills sta., n. Sacramento Co., *Jepson* 15,731). In the broken sequence of moisture and dryness and varying temperatures in a particular season, irregular stimulation of some individuals of Navarretia leucocephala may, perhaps, furnish an explanation of the reason why Navarretia prostrata has sometimes been attributed to the Great Valley (Greene, Man. Reg. S. F. Bay, 246; Jepson, Man. 788). Constant technical differentiae between the two species appear to be lacking; habit simulation is at times obvious. Therefore, it seems better to restrict Navarretia prostrata geographically to coastal Southern California and Monterey Co. Stations are cited as follows: National City, sw. San Diego Co., *Cleveland;* Wilmington, *Nevin;* Downey, *Davidson;* Los Angeles, *Gardner;* Upland, San Bernardino Valley, *Parish* 11,162; Jolon, Monterey Co., *Keck & Stockwell* 3225. At the end one needs to hazard that a species so weak technically may need reducing to varietal rank under N. leucocephala.

Refs.—NAVARRETIA PROSTRATA Greene, Pitt. 1:130 (1887); Jepson, Man. 788 (1925). *Gilia prostrata* Gray, Proc. Am. Acad. 17:223 (1882), type loc. near Los Angeles, *J. C. Nevin;* Jepson, Fl. W. Mid. Cal. 427 (1901), ed. 2, 332 (1911).

4. **N. intertexta** Hook. (Fig. 375.) Stem erect and usually simple, or branching from the base, and usually diffuse, 2 to 7 inches high; herbage white-puberulent but not glandular; leaves 4 to 12 lines long, bipinnatifid, the narrowly linear or filiform segments spinescent-tipped; bracts pinnatifid, strongly dilated at base, the slender or filiform rigid spinose divisions extended beyond body of the head; body of bracts and exterior of calyx-tube densely white-villous or woolly-tomentose; calyx-lobes with a tuft of hairs on the base inside, otherwise glabrous or nearly; calyx ⅔ as long as corolla; corolla white or pale lavender, slender-funnelform, 4½ lines long; anthers yellow; style 2-cleft; stamens and style exserted from corolla-throat; capsule 4 to 12-seeded; seeds shallowly favose.

Margins of hog wallows or low wet spots in valleys and hills, or gravelly plains, or in opens in forest, 50 to 6000 feet.: Cuyamaca Mts., San Diego Co.; North Coast Ranges from Sonoma and Napa Cos. to western Siskiyou Co.; Great Valley from Stanislaus Co. to Shasta Co.; northern Sierra Nevada foothills from Mariposa Co. to Shasta Co.; east and north sides of the northern Sierra Nevada from eastern Sierra Co. to eastern Siskiyou Co. North to Washington and Montana. May-July.

Locs.—Cuyamaca Mts.: near Cuyamaca Peak, *T. Brandegee;* Stonewall Mine, *Parish* 4464. North Coast Ranges: Kenwood, Sonoma Co., *Bioletti;* York Creek, St. Helena, *Jepson* 2351; Calistoga, *Jepson* 15,007; Healdsburg, *Alice King;* Cobb Mt., sw. Lake Co., *Jepson* 15,012; Bartlett Sprs., n. Lake Co., *Jepson* 18,940; Potter Valley, Mendocino Co., *Nettie Purpus;* Round Valley, ne. Mendocino Co., *Tracy* 15,766; Miranda, South Fork Eel River, *Jepson* 12,367; Dyerville, *Constance* 697; Carlotta, Humboldt Co., *M. S. Baker* 26; Green Point ranch, near Redwood Creek, n. Humboldt Co., *Jepson* 1943; Martin ranch, South Fork Trinity River, *Jepson* 2019; Sisson, Siskiyou Co., *Jepson* 15,008; Oro Fino, Siskiyou Co., *Butler* 157. Great Valley: Montpelier, Stanislaus Co., *Hoover* 586; Stockton, *Sanford* 58; Rio Linda, n. Sacramento Co., *Hoover* 2210; Roseville, Placer Co., *R. E. Arp;* Sutter, Sutter Co., *Ewan* 9623; Chico, *Palmer;* Redding, *Blankinship.* Northern Sierra Nevada foothills: Ruth Pierce Mine, Mariposa Co., *Jepson* 10,701; Chinese Camp, Tuolumne Co., *Jepson* 6328; Duffield Cañon, Soulsbyville, *Jepson* 7682; Salt Springs Valley, Calaveras Co., *Tracy* 5650; Burson, Calaveras Co., *Jepson* 9948; Valley Springs, Calaveras Co., *Jepson* 9909; San Andreas, *Jepson* 9946; Foster sta., Amador Co., *K. Brandegee;* Sweetwater Creek, Eldorado Co., *K. Brandegee;* Auburn, *Shockley;* Pentz, Butte Co., *Heller* 10,759; Big Bear Flat, se. Siskiyou Co., *Jepson* 20,102; Shasta Retreat, Siskiyou Co., *Condit.* East and north sides Sierra Nevada: Sierra Valley, *Lemmon* 299; Dog Valley, e. Sierra Co., *Jepson* 15,014; Mt. Shasta (n. side), *H. E. Brown.*

Var. **propinqua** Brand. Plants smaller, ½ to 3 (or 5) inches high, in aspect like N. breweri; at least some of the leaves and bracts bipinnatifid; bracts and calyces white-tomentulose to subglabrous; divisions of bracts slender-subulate or aristiform, as if set in somewhat regular parallel ranks; calyx about as long as the corolla; capsule about 2 to 5-seeded.—Wet meadows or margins of ponds, 3500 to 6700 feet: Eldorado Co. to Modoc Co.; inner North Coast Range from northern Lake Co. to western Siskiyou Co. North to Washington. June-Aug.

Locs.—Northern Sierra Nevada: Meyers sta., Eldorado Co., *Ottley* 936; Bear Valley, Nevada Co., *Jepson* 15,011; Dog Valley, e. Sierra Co., *Jepson* 15,010; Sierra Valley, *Lemmon;* Ferris Creek, branch of Last Chance Creek, e. Plumas Co., *Jepson* 19,390; Mineral, e. Tehama Co., *Jepson* 12,340; Battle Creek Mdws., e. Tehama Co., *J. Grinnell;* South Fork Peak, n. Lassen Co., *Jepson* 7815; Fort Bidwell, *Manning* 48. Inner North Coast Range: Elk Mt., n. Lake Co., *Tracy* 2281; Soldier Ridge, se. Trinity Co., *Jepson* 15,009; Yreka, *Butler* 998.

Refs.—NAVARRETIA INTERTEXTA Hook., Fl. Bor. Am. 2:75 (1838); Jepson, Man. 788, fig. 768 (1925). *Aegochloa intertexta* Benth., Bot. Reg. sub t. 1622 (1833), "California and northwest America," *Douglas. Gilia intertexta* Steud., Nom. Bot. ed. 2, 1:683 (1840); Jepson, Fl. W. Mid. Cal. 427 (1901), ed. 2, 332 (1911). Var. PROPINQUA Brand; Engler, Pflzr. 4^{250}:163 (1907). *N. propinqua* Suksd., Allg. Bot. Zeitschr. 12:26 (1906), type loc. Spokane Co., Wash., *Suksdorf.*

5. **N. tagetina** Greene. Stem erect, simple or corymbosely branching, 3 to 12 inches high, the heads solitary and terminal or sometimes congested; herbage puberulent; leaves 4 to 15 lines long, bipinnatifid into short subulate or filiform segments; bracts bipinnatifid into rigid acicular or spiny divisions crowning the much-dilated and mostly entire basal portion of the rachis; bracts and calyces finely pubescent, sometimes tomentulose (especially on the body of the bracts); calyx-segments (or

some of them) pinnatifid with cuspidate or subulate segments; corolla pale blue, 3½ to 5 lines long, about 1¼ times as long as the calyx, the throat funnelform; stamens inserted on base of corolla-throat; style 3-cleft; capsule 2 to several-seeded, not regularly dehiscent; seeds pitted.

Low open hills and valley floors, 30 to 1000 (or 4300) feet: Cuyamaca Mts., Southern California; North Coast Ranges from Sonoma and Napa Cos. to western Siskiyou Co.; Sacramento Valley; Sierra Nevada foothills from Tuolumne Co. to Butte Co. North to Washington. Apr.-June.

Biol. note.—By mid-May or June the foliage leaves, both basal and cauline, of the stems of Navarretia tagetina have largely disappeared, and the slender divisions of the bracts and calyces of the flower heads have become indurated or spiny. The innermost bracts are not only spiny-bipinnatifid above, but are armed with forked spines inside the margin of the much-broadened lower portion of the rachis which is somewhat coriaceous and is glabrous inside. Since these spiny inner bracts invest closely the spiny-tipped calyces, they become physiologically a part of the fruit and thus make of the capsule a sort of bur. Because these calyces and bracts invest the capsule so closely, they sometimes simulate an outer capsule! The capsule itself is extremely thin-walled. Towards maturity the thin capsular walls collapse closely about the seeds and become somewhat indurated. The capsule is, therefore, not regularly dehiscent.

The stamens are shortly exserted, with the filaments inserted on or near base of the corolla-throat. The style is rarely 2 or 4-cleft.

Locs.—Cuyamaca Mts., S. Cal.: Cuyamaca Lake, *K. Brandegee.* North Coast Ranges: Davis Hills, Vaca Mts., *Jepson* 15,023; betw. Santa Rosa and Sebastopol, *K. Brandegee;* Howell Mt., Napa Range, *Jepson* 15,027; Pope Valley, Napa Co., *Jepson* 15,689; Calistoga (hills sw.), *Jepson* 15,022; Cobb Mt., sw. Lake Co., *M. S. Baker* 2258a; Hullville, Gravelly Valley, n. Lake Co., *Jepson* 15,026; Ukiah Valley, *Jepson* 9278; Dobbyn Creek forks, Humboldt Co., *Tracy* 4709; Mail Ridge, s. Humboldt Co., *Jepson* 16,386; Grasshopper Ridge, head of Canoe Creek, Humboldt Co., *Tracy* 4758; Yreka, *Butler* 740. Sacramento Valley: Birds Ldg., s. Solano Co., *Jepson* 15,024; Vacaville, *Jepson* 4246; Sweeney Creek, nw. Solano Co., *Jepson* 9052; Pleasant Grove, Sutter Co., *Hoover* 2217; Pine Creek road sta., Tehama Co., *Jepson* 12,351; Sourgrass Creek, 7 mi. s. of Corning, *Jepson* 18,969. Sierra Nevada foothills: Chinese Camp, Tuolumne Co., *Hoover* 2370; Salt Springs Valley, Calaveras Co., *Tracy* 5661; Ione, Amador Co., *Braunton* 1030; Pilot Hill, Eldorado Co., *K. Brandegee;* Oroville (8 mi. n.), *Heller* 11,383; Hutton Creek, near Hornbrook, e. Siskiyou Co., *Jepson* 19,966.

Refs.—NAVARRETIA TAGETINA Greene, Pitt. 1:137 (1887), type loc. Siskiyou Co., *Greene.* *N. pubescens* var. *tagetina* Jepson, Man. 789 (1925).

6. **N. subuligera** Greene. Stem erect and subsimple or branching, somewhat flexuous, 2 to 6 inches high, microscopically puberulent; leaves glabrous or subglabrous, ½ to 1¼ inches long, pinnately divided into linear-filiform or subulate lobes with 1 to 3 pairs of lobes below the middle, the terminal lobe elongated; lowest leaves linear-filiform, entire; flower heads borne racemosely on short peduncle-like branches along the main stem, the peduncles ¼ to 1 inch long; bracts ovate, coriaceous, spiny-pinnatifid, the central spine prominent and much surpassing the head proper, the back of the bracts bearing spines just inside the margin; calyx-lobes 4 or 5, all entire, 2 or 3 rather short; mouth of calyx-tube inside with a ring of hairs; corolla white, 3 lines long, shorter than the calyx; stamens included; style 3-cleft; capsule translucent, closely invested by the bracts so as to form a sort of bur; seeds several, agglutinated in a mass.

Rocky plains or mountain slopes, 400 to 2500 feet: foothill or rocky borders of the Sacramento Valley, but little-known and very rare (Amador Co.; Mt. St. Helena; Tehama Co.). North to southern Oregon. May-June.

Field note.—A rocky plain of rubble stones, anciently derived from one of the great eruptions of Lassen Peak, lies 3 to 6 miles northeast of Red Bluff, in the upper Sacramento Valley. On it two collections have been made of the plant here called Navarretia subuligera, namely *Jepson* 16,355 and 16,347. These specimens are conspecific with specimens found on Mt. St. Helena (*Eastwood* 4670), teste Virginia Bailey, as also with specimens from near Trail, Jackson Co., Ore., *J. T. Howell* 6778. No material has been seen from the type locality of this species.

Ref.—NAVARRETIA SUBULIGERA Greene, Pitt. 1:137 (1887), type loc. "Amador Co." (that is, Sierra Nevada and undoubtedly in the foothills), *Curran.*

7. **N. nigellaeformis** Greene. ADOBE GILIA. Stems 3 to 5 inches high, simple, or branched from the base, minutely puberulent; leaves subglabrous, ¾ to 1¾

inches long, the blades bipinnatifid, the segments filiform, rather crowded, pungent; bracts not dilated at base, or sometimes with an oblong dilation, spinosely pinnatifid or bipinnatifid above, glandular-puberulent, and often tomentose about the middle; flowers 5-merous; calyx nearly equaling corolla-tube, its tube membranous, puberulent outside, markedly villous-pubescent at throat, its teeth green-herbaceous, the long teeth pinnatifid and about as long or 1½ times as long as the calyx-tube, the 2 or 3 short teeth entire; corolla pale yellow or buckskin color, usually with 5 brownish quadratish spots in the throat, 4 to 6 lines long; stamens unequally inserted on the middle of corolla-throat, the anthers exserted from the throat; style 2-cleft; capsule 1-celled or sometimes imperfectly 2-celled, 4-valved above the translucent base, 4 to 8-seeded.

Low places on valley floors, 100 to 1200 feet: Great Valley and its lowest bordering foothills; South Coast Ranges in San Benito and San Luis Obispo Cos. May.

Locs.—Great Valley and its low bordering foothills: Dry Creek, sw. of Pentz, Butte Co., *Heller* 11,402; Willows, Glenn Co., *Jepson* 20,955; Antioch; Athlone, Merced Co., *Hoover* 604; Merced, *Congdon;* Porterville, Tulare Co., *T. Brandegee;* Long Tom Mines, Greenhorn Mts., *Charlotte N. Smith.* South Coast Ranges: San Miguel, *Norton;* Paso Robles, *Cobb* 6; Goodwin, e. San Luis Obispo Co. This species flowers later than Navarretia cotulaefolia when growing with it.

Refs.—NAVARRETIA NIGELLAEFORMIS Greene, Pitt. 1:132 (1887), type loc. Visalia, *T. J. Patterson;* Jepson, Man. 789 (1925). *N. ocellata* Eastw., Zoe 5:88 (1900), type loc. Goodwin, San Luis Obispo Co., *Jared* (typ. vidi). *N. nigellaeformis* var. *radions* J. T. Howell, Lflts. W. Bot. 2:136 (1938), type loc. Paicines (12 mi. s.), San Benito Co., *J. T. Howell* 12,962; ovary 2-celled.

8. **N. cotulaefolia** H. & A. Stem erect, corymbosely branching from above base, 2 to 6 (or 13) inches high; herbage finely puberulent and minutely glandular; leaves ½ to 3 inches long, bipinnatifid, the segments linear, soft, barely cuspidate; bracts and calyx glandular-villous, glabrous or subglabrous at the base; flowers commonly 4-merous; calyx about ⅔ as long as corolla, its lobes varying from nearly equal and entire to unequal, with the longer variously toothed; corolla creamy or dull white, 3½ to 5 lines long, somewhat exceeding the calyx; stamens equally inserted about middle of corolla-throat; style 2-cleft; capsule 1-celled, 4-valved, dehiscing from the base, 1-seeded; embryo with entire cotyledons.

Depressions in valley floors, 15 to 1500 feet: Coast Ranges (back of the coast line) from San Benito Co. to Sonoma and Lake Cos.; Sacramento Valley. May.

Locs.—Coast Ranges: Hollister, *A. H. Kemp;* Balsa, east of Gilroy, *Jepson* 15,002; Newark, Alameda Co., *Davy* 1100; Kirker Pass (n. of), Contra Costa Co., *Brewer* 1110; Wilfred sta., Cotati Valley, Sonoma Co., *Jepson* 9307; Pope Valley, *Ewan* 8857; Lakeport, *M. S. Baker;* Bear Valley, sw. of Leesville, w. Colusa Co., *Jepson* 8965. Sacramento Valley: Vacaville, *Jepson* 15,000; Sutter, Sutter Co., *Ewan* 9627; Willows, Glenn Co., *Jepson* 15,003.

Refs.—NAVARRETIA COTULAEFOLIA H. & A., Bot. Beech. 368 (1840); Jepson, Man. 789 (1925). *Aegochloa cotulaefolia* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas. Gilia cotulaefolia* Steud., Nom. Bot. ed. 2, 1:683 (1840); Jepson, Fl. W. Mid. Cal. 427 (1901), ed. 2, 332 (1911).

9. **N. bowmanae** Eastw. Stem erect, simple or branched, 3 to 12 inches high; herbage minutely but densely whitish-puberulent; leaves ¼ to 1¼ inches long, the blades bipinnately divided with filiform divisions; heads dense, white-woolly; bracts finely bipinnatifid, the more or less dilated base densely white-woolly, often puberulent to the tips of the acerose teeth, ⅓ to 1¾ inches long, surpassing the heads; flowers 4 or 5-merous; calyx ¾ to nearly as long as corolla, its lobes unequal, acerose-tipped, the longer often pinnately toothed; corolla 3½ to 5 lines long, blue (with white throat) or white, a dark purple spot in throat below each lobe; stamens unequally inserted about middle of corolla-throat; style more or less 2-cleft; capsule 1-celled, 4-valved, 1-seeded.

Low dry gravelly hills and valley flats, 15 to 1500 feet: North Coast Ranges from Lake Co. to Solano Co.; Great Valley from Shasta Co. to Stanislaus Co.; Sierra Nevada foothills from Eldorado Co. to Tuolumne Co. May-June.

Field note.—At intervals for three or four decades botanists have been collecting in the Sacramento Valley and northern Sierra Nevada foothills a Navarretia which has been referred with doubt to Navarretia cotulaefolia or to Navarretia pubescens or indicated as allied to one or the other but different. This material has been segregated by Virginia Bailey and a diagnosis prepared for this unit. It seems to be the same as Navarretia bowmanae Eastw. of Lake County and that name is here tentatively used, although Navarretia bowmanae lies outside the main range of this unit. Navarretia bowmanae rests, as to its type, upon specimens collected at Anderson ranch near Lower Lake in Lake County. For this problem two excellent collections, one in flower and one in fruit, have been made at the type locality by Mabel H. Hazell. The corollas in the Hazell plants are either blue or white. The corollas in the type were described as yellow. In the Sacramento Valley plant the corolla is blue, but in one instance has been observed to change from blue to dull yellow in drying. As here described, the following stations are cited for collections of Navarretia bowmanae:

Locs.—North Coast Ranges: Anderson ranch, Lower Lake, Lake Co., *Mabel H. Hazell;* Dutton Cañon, Vaca Mts., *Jepson* 21,104. Great Valley: Cottonwood, Shasta Co., *J. T. Howell* 12,233; Red Bluff (6 mi. n.), *Hoover* 2288; near Cana, Butte Co., *Hoover* 2239; Sourgrass Creek, 9 mi. n. of Orland, *Jepson* 18,971; Roseville, Placer Co., *R. E. Arp;* Browns Valley, nw. Solano Co., *Jepson* 15,013; Hass Slough, e. Solano Co., *Jepson* 15,037; betw. Oakdale and La Grange, e. Stanislaus Co., *Jepson* 21,103. Sierra Nevada foothills: betw. Pilot Hill and Cool, Eldorado Co., *K. Brandegee;* San Andreas (5 mi. w.), *Jepson* 9945; Copperopolis, Calaveras Co., *Tracy* 5593; Chinese Camp, Tuolumne Co., *Hoover* 2371.

Refs.—Navarretia bowmanae Eastw., Bot. Gaz. 37:444 (1907), type loc. Anderson ranch, Lower Lake, Lake Co., *Agnes Bowman* (typ. vidi). *N. cotulaefolia* var. *bowmanae* Brand; Engler, Pflzr. 4^{250}:158 (1907).

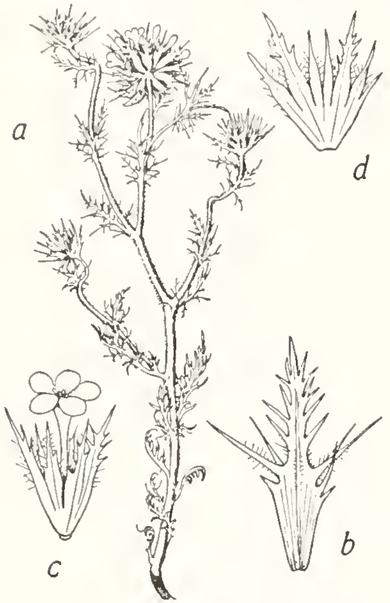

Fig. 376. Navarretia pubescens H. & A. *a*, habit, × ⅓; *b*, bract, × 2; *c*, fl., × 1½; *d*, calyx spread open, × 1½. Drawn from *Douglas* type, Royal Botanic Gardens, Kew (Herb. Benth.).

10. **N. pubescens** H. & A. (Fig. 376.) Stem erect, usually branching above, 5 to 18 inches high; herbage puberulent; leaves ½ to 2 inches long, pinnately divided with the divisions pinnatifid or pinnately divided or toothed, terminal portion of the upper leaves less deeply divided or merely laciniate-toothed, so that the rachis appears as if spatulate-dilated; bracts villous, palmately parted above the broad base, the spinose divisions spinosely pinnatifid or entire, the broad base covered outside with a web of villous hairs or subglabrous; basal portion of bracts and calyces white-chartaceous; middle portion of calyces villous, sometimes merely puberulent; calyx-lobes unequal, 3 entire and the 2 longer toothed, or all pinnately toothed; corolla narrowly funnelform, deep blue (a white line in throat below each sinus, or throat and tube white), 4½ to 8 lines long, 1¼ times as long as the calyx; corolla-throat longer than corolla-lobes; stamens exserted, the filaments inserted in base of throat; style 2-cleft; capsule 1-celled, 4-valved, dehiscent from below, 1 (or rarely 2)-seeded; cotyledons of the embryo parted into 3 lobes, the divisions so deep as to give the appearance of 6 cotyledons.

Dry soil of low hills and valleys and on sandy plains, 10 to 1500 (or 2100) feet: Coast Ranges from San Luis Obispo Co. to Humboldt Co.; Great Valley from Kern Co. to Tehama Co.; Sierra Nevada foothills from Kern Co. to Butte Co. North to southern Oregon. May-June.

Locs.—Coast Ranges: Estrella, San Luis Obispo Co., *Jared;* Paso Robles, *Cobb* 7; Los Gatos foothills, *Heller* 7484; Kirker Pass, Contra Costa Co., *Brewer* 1113; Davis Hills, Vacaville, *Jepson* 15,042; Putah Creek ford, near Pleasants Valley, nw. Solano Co., *Jepson* 21,222; Calistoga, *Jepson* 15,040; Coyote Valley, s. Lake Co., *Jepson* 20,963; Knoxville, ne. Napa Co., *Jepson* 20,964; Venado, sw. Colusa Co., *Jepson* 16,256; Asa Bean Ridge, ne. Mendocino Co., *Jepson* 15,043; Alder Point, Humboldt Co., *Tracy* 4733. Great Valley: Edison, Kern Co., *Jepson* 18,143; Clovis, Fresno Co., *K. Brandegee;* Turlock, Merced Co., *Hoover* 602; Burnet sta., se. San Joaquin Co., *Jepson*

15,041; Montezuma Hills, se. Solano Co., *Jepson* 15,039; College City, Colusa Co., *Alice King;* Pleasant Grove, Sutter Co., *Hoover* 2216; Pine Creek road sta., Tehama Co., *Jepson* 12,352. Sierra Nevada foothills: Woody (4 mi. e.), Greenhorn Mts., Kern Co., *C. N. Smith* 195; betw. Davis ranch and Watson Spr., North Fork Kaweah River, *Jepson* 579; betw. Badger and Miramonte, Fresno Co., *Newlon* 184; Cathay Valley, Mariposa Co., *Jepson* 12,766; Chinese Camp, Tuolumne Co., *Jepson* 6314; Copperopolis, Calaveras Co., *Tracy* 5592; Valley Springs, Calaveras Co., *Jepson* 10,033; San Andreas (5 mi. w.), *Jepson* 9941; Sweetwater Creek, Eldorado Co., *K. Brandegee;* Auburn, *Shockley;* Pentz, Butte Co., *Heller* 10,757.

Refs.—NAVARRETIA PUBESCENS H. & A., Bot. Beech. 368 (1840); Jepson, Man. 789 (1925). *Aegochloa pubescens* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas. Gilia pubescens* Steud., Nom. Bot. ed. 2, 1:684 (1840); Jepson, Fl. W. Mid. Cal. 428 (1901).

11. **N. mitracarpa** Greene. Stem with few to several slender branches from or near the base, 2 to 10 inches high, erect or sometimes diffuse, sometimes reduced to a short stem (1 inch high) and a single head; herbage puberulent; leaves ½ to 1½ inches long; lower leaves (sometimes only the very lowest) pinnately divided so as to be remotely and regularly pectinate, the segments short-acerose, entire, cuspidate, ½ to 1½ lines long; upper leaves pinnately divided, the acerose segments bipartitely lobed, the terminal segment (in all or some of the leaves) oblanceolate with the margin cut into upwardly pointed laciniae; bracts glandular-pubescent, similarly twice pinnatifid but with the terminal segment oblanceolate, its margin laciniately toothed; calyx about ⅔ as long as corolla, its lobes nearly twice as long as the calyx-tube, entire or 1 or 2 of the longer lobes toothed; corolla blue, 3½ to 5 lines long, the tube white, filiform, the throat ample, yellowish above and white below, about as long as corolla-lobes or a little shorter, the limb 2 to 2¼ lines broad; stamens inserted at base of corolla-throat; capsule 4-angled at summit, 1-celled, 1-seeded, 4-valved; apex of capsule with a papilla-like apiculation; cotyledons as if 6, each of the 2 cotyledons deeply parted into 3 lobes.

Clay soil of dry hills and flats, 800 to 1500 feet: Santa Barbara Co.; South Coast Ranges from San Luis Obispo Co. to San Benito and Monterey Cos.; Lake Co. May.

Field note.—In southern San Benito and Monterey counties and in northern San Luis Obispo County in the drainage basin of the upper Salinas River, is an area inhabited by a Navarretia of quite constant aspect. Its stems are slender and erectly or somewhat corymbosely branched from the base; the terminal segment of the pinnatifid leaves tends to be lanceolate with upwardly-pointed marginal laciniae; the heads are somewhat glandular and rather constantly uniform in size. This plant has been described as Navarretia jaredii Eastw. (1900), but it agrees in every detail of habit, flower, fruit and embryo with an isotype of Navarretia mitracarpa Greene (1887).

Navarretia mitracarpa was first collected in June, 1884, by M. K. Curran, "somewhere in Lake County." On account of the disorderly habits of the collector, M. K. Curran, in handling and labeling plant materials, and by reason of the fact that Navarretia mitracarpa has not since 1884 been collected in Lake County, it is a natural query whether the type specimens may not have come from Monterey County. On the other hand, this is to be said: an itinerary of M. K. Curran (K. Brandegee), although compiled from doubtful, incomplete, fragmentary and sometimes contradictory records, seems to show that M. K. Curran was definitely in Lake County in June, 1884, and it is here suggested that Navarretia mitracarpa should be sought for on or near Kelsey Mountain.

In Lake County and in southwestern Colusa County a Navarretia resembling Navarretia mitracarpa has been frequently collected and labeled as that species. It is a coarser plant than Navarretia mitracarpa, has a prostrate habit, finely bipinnatifid leaves and larger heads. It differs from Navarretia mitracarpa also in details of flower and capsules. It is a different thing and is described below as new.

The representation of Navarretia mitracarpa in the South Coast Ranges is distinguished by an outstanding character of the embryo, namely this, that the cotyledons are so deeply cleft into three lobes as to seem like six cotyledons. As soon as it was established that the embryo in the isotype material of Navarretia mitracarpa had also this remarkable character of deeply cleft cotyledons, then the prostrate plants of Lake County, referred to above, were not merely excluded on thus being uncovered, they became at once fugitives from Navarretia mitracarpa. Nameless, they have been named Navarretia jepsonii V. Bailey. Their cotyledons are entire.

Locs.—South Coast Ranges: San Miguelito rancho, near Jolon, Monterey Co., *Jepson* 1630; upper San Benito River near Lorenzo Creek, *Jepson* 12,238 (sufficiently abundant to furnish food for the honey bee); divide at head of Los Gatos Creek, w. Fresno Co., *Jepson* 12,194; Stone Cañon, se. Monterey Co., *Condit;* San Miguel (5 mi. n.), *Keck* 2837; Paso Robles, *K. Brandegee;* Templeton, *Davy* 7579; Santa Margarita, *Summers;* Coalinga (hills w.), Fresno Co., *Condit.* Santa Barbara Co.: Figueroa ranger sta., San Rafael Mts., *Hoffman.*

Refs.—NAVARRETIA MITRACARPA Greene, Pitt. 1:135 (1887), type loc. "somewhere in Lake Co.," *Curran;* Jepson, Man. 790 (1925). *N. jaredii* Eastw., Zoe 5:89 (1900), type loc. Paso Robles Creek, San Luis Obispo Co., *L. Jared;* Jepson, Man. 789 (1925).

12. **N. jepsonii** V. Bailey sp. n. Stem branching at or above the base, prostrate or diffuse, the branches slender, 4 to 6 inches long, often proliferous from beneath the initial subsessile heads; herbage minutely puberulent; leaves 4 to 7 lines long, bipinnately divided into filiform or subulate segments ½ to 2 lines long; bracts bipinnatifid into subulate segments; calyx-teeth lanceolate, ciliate, equaling or exceeding the calyx-tube, all entire or the 3 longer toothed; calyx-tube glabrous or subglabrous, with narrow membranous intervals beneath the sinuses running halfway to base; corolla purple with a darker purple spot at the base of each lobe, 3 to 4 lines long, equaled by the longer calyx-teeth; stamens inserted a little above base of corolla-throat, the filaments exserted; style 2-cleft; capsule 1-celled, 1-seeded, more or less membranous (especially below), the rounded summit with a papilla-like apiculation, acutish at base, 8-valvate from base; cotyledons 2, entire.—(Planta ramosa, prostrata vel diffusa, ramis gracilentis 4–6 unc. longis, saepe proliferis ab basi capitulorum primorum subsessilium; pubes minuta; folia 4–7 lin. longa, bipinnatifida, segmentis filiformibus aut subulatis; calycis dentes lanceolati, ciliati, integri vel 3 longiores denticulati, tubo aequantes vel superantes; corolla 3–4 lin. longa, purpurea, lobis maculatis ad basin; stamina exserta; stylus bifidus; capsula uniloculata, unisperma, plus minusve membranacea, octovalvata, apiculata ad apicem; cotyledones 2, integrae.)

Deeply checked clays of valley floors or flats in the dry hills, 1500 to 2500 feet: North Coast Ranges from southwestern Colusa Co. to central Napa Co. June-July.

Field note.—Navarretia jepsonii is a rather narrow endemic of the Clear Lake region. It comes into flower in the dry season and is an inhabitant of low spots on valley floors or flats in the hills. The following stations validate its range: Epperson sta., Bear Valley, sw. Colusa Co., *K. Brandegee;* Indian Valley, ne. Lake Co., *K. Brandegee;* Mt. Konocti (Uncle Sam Mt.), (Erythea 1:16); Knoxville Ridge, se. Lake Co., *Jepson* 20,956; Coyote Valley, s. Lake Co., *Jepson* 20,966; Aetna Sprs., Pope Valley, *K. Brandegee.*

The differentials between Navarretia mitracarpa, chiefly of the South Coast Ranges as at present known, and Navarretia jepsonii of the Clear Lake region have been worked out by Virginia L. Bailey as follows: "In Navarretia mitracarpa the corolla-throat is as long or nearly as long as the corolla-lobes, the corolla-tube is glandular-puberulent outside; the style is definitely 2-cleft to barely 2-cleft; the capsule, about 1½ lines long, is 4-ridged or 4-angled at the summit and 1-seeded, and it is also 4-valved from the base.

"In Navarretia jepsonii the corolla-throat is shorter than the corolla-lobes, the corolla-tube is glabrous outside; the style is barely 2-cleft to entire; the capsule, 1 to 1⅛ lines long and 1-seeded, is not 4-angled or 4-ridged at summit but is 4-nerved at summit with the nerves branching and thus 8-nerved at base. At base, too, the capsule is 8-valved."—Virginia L. Bailey.

Segregation of the species, Navarretia jepsonii, is the result of careful and conscientious work by Virginia L. Bailey as a research assistant on the Flora of California. She was the first to distinguish this Lake County plant from the true Navarretia mitracarpa. (See sub no. 11.)

Refs.—NAVARRETIA JEPSONII V. Bailey; type loc. Coyote Valley, s. Lake Co., *Jepson* 20,966 (typ. in Herbario Jepsoniano). *N. mitracarpa* Jepson, Erythea 1:16 (1893); not Greene (1887).

13. **N. setiloba** Cov. Stem erect, branching from near the base or subsimple, 4 to 9 inches high; herbage minutely puberulent; leaves ¼ to 1⅛ inches long, bipinnatifid with short acicular segments, the terminal lobe conspicuous, ovate-lanceolate, 4 to 9 lines long, its margin irregularly and finely laciniate; bracts with lanceolate terminal lobe and subregular acerose-toothed margin, the rachis bearing on and above the dilated base 2-forked acerose segments; calyx rather shorter than the corolla-tube, its lobes lanceolate with broad base, entire or with very small teeth, ½ as long as the calyx-tube; corolla blue, 4 to 5 lines long; stamens inserted at base of corolla-throat; style 2-cleft; capsule translucent at base and closely adherent to the single whitish seed, the coriaceous top of the capsule dehiscent like a lid.

Hillslopes and plateau flats in red gravelly clays, 5000 to 7000 feet: southern Sierra Nevada in Kern Co. June.

Field note.—Navarretia setiloba is similar in appearance to the variable and wide-spread N. atractyloides. A very narrow endemic and only slightly collected, it is, in consequence, but little known. Two localities are all that can here be recorded: betw. Havilah and Kernville, *K. Brandegee;* betw. Walker Basin and Hackberry Cañon, *K. Brandegee.*

Refs.—NAVARRETIA SETILOBA Cov., Contrib. U. S. Nat. Herb. 4:153, pl. 14 (1893), type loc. divide between Kernville and Havilah, Kern Co., *Coville* 1049; Brand in Engler, Pflzr. 4^{250}:161 fig. 34 A–C (1907); Jepson, Man. 789 (1925).

14. **N. filicaulis** Greene. Stems 1 to several from the base, very slender or wiry, erect, 2 to 10 inches high; herbage minutely glandular-puberulent; leaves filiform, entire, ½ to 1¼ inches long, or pinnately divided with 1 or 2 pairs of short-filiform lobes near the base, or at the middle and remote; flowers in small heads, the heads 1½ to 2½ lines broad, borne in a panicle on peduncles ¼ to 1 (or 1¼) inches long; bracts palmately 3 or 5-cleft, the body ovate or orbicular, the central lobe prolonged with subulate-spinose tips exceeding the flowers; calyx 1½ lines long, the teeth unequal, 2 or 3 longer and about ½ length of calyx-tube; corolla dark purple, 2½ lines long; stamens and style exserted, 1½ times as long as corolla; stamens inserted on base of corolla-throat; style entire or nearly so; capsule thin-walled, 1-celled (or imperfectly 2-celled), 4-valved from the apex, 4 to 8-seeded.

Dry hills, 500 to 2500 feet: Sierra Nevada foothills from Shasta Co. to Mariposa Co. June-July.

Locs.—Between Morley road sta. and Stevens ranch, ne. Shasta Co., *M. S. Baker;* Forest Ranch, Butte Co., *Heller* 11,626; Grass Valley, Nevada Co., *Heller* 8111; Cape Horn, Placer Co., *K. Brandegee;* Sweetwater Creek, Eldorado Co., *K. Brandegee;* Gwin Mine, Calaveras Co., *Jepson* 2174a; Moccasin Creek (head of), Mariposa Co., *Hoover* 2461; Coulterville, Mariposa Co., *Jepson* 20,958.

Refs.—NAVARRETIA FILICAULIS Greene, Pitt. 1:134 (1887); Jepson, Man. 790 (1925). *Gilia filicaulis* Torr.; Gray, Proc. Am. Acad. 8:270 (1870), type from Cal., *Jeffrey* 1474. *N. dubia* Brand; Engler, Pflzr. 4^{250}:157 (1907), type from the Sierra Nevada, *Jeffrey* 1474.

15. **N. prolifera** Greene. Main stem erect, simple, 1 to 3 inches high, bearing a single terminal head, with 2 to several branches proliferous from beneath the primary head, these branches slender or filiform, naked, 1 to 3 inches long, each bearing a single head; herbage glabrous, the bracts white-tomentulose; leaves 5 to 11 lines long, filiform and entire, or with 1, 2 or 3 remote pairs of short filiform lobes ½ to 1 line long; bracts palmately 3 to 5-cleft, the undivided portion white-chartaceous; calyx about ⅔ as long as corolla, its teeth subulate, about twice as long as the chartaceous calyx-tube, entire, villous or somewhat tomentulose; corolla purple or yellow, 3 to 5 lines long, its throat broadly expanded; stamens very shortly exserted, the filaments inserted on upper half of corolla-throat; style 3-cleft; capsule 3-celled, 3-valved, about 3 to 5 seeds to each cell.

Chaparral slopes, 2000 to 4000 feet: Sierra Nevada foothills from Plumas Co. to Tulare Co. June.

Geog. note.—The center of distribution of Navarretia prolifera, a rare species as at present known, is in Eldorado Co. where it has been collected a number of times: Sly Park, *Hall* 11,381; Fyffe, 12 mi. e. of Placerville, *K. Brandegee;* Camino, *K. Brandegee.* Other localities for this species are: Foster, Amador Co., *Curran,* and Cherry Gulch, Plumas Co., acc. *W. I. Follett.* Between Amador Co. and Tulare Co. ("near Visalia") there is a broad gap in which the species is not known to occur.

Habit note.—The initial flower head in Navarretia prolifera is terminal on the main axis which varies in length. If, however, as in some individuals, the main axis becomes so extremely shortened as to be called obsolescent, in such case no flower head is produced on the main axis, that is to say no flower head is developed at the ground. This condition is in contrast to Navarretia prostrata where the initial head is regularly sessile on the ground with the branches rotately proliferous from beneath it. In Navarretia leucocephala and in N. mitracarpa the initial flower head is not infrequently sessile or subsessile on the ground, but perhaps more commonly it is lifted more or less on the main axial stem.

Refs.—NAVARRETIA PROLIFERA Greene, Pitt. 1:135 (1887), type loc. "near Visalia" (undoubtedly in the Sierra Nevada foothills east), *T. J. Patterson;* Jepson, Man. 790 (1925). *N. prolifera* var. *lutea* Brand, Ann. Conserv. et Jard. Bot. Genève, 15–16:338 (1913).

16. **N. divaricata** Greene. Plants 1¼ to 3¾ inches high, usually much broader than high; main stem terminated by a head of flowers, then proliferously and diffusely branched; leaves filiform or acicular, 4 to 9 lines long, entire or with 2 pairs of short-acicular teeth near the base; herbage villous or glabrate; body of heads 3 to 5 lines broad; bracts white-pubescent at base, palmately cleft into 3 to 5 acerose divisions, equaling or exceeding the flowers; calyx 2 to 2½ lines long, exceeding or at least equaling the corolla, rarely a little shorter, its lobes very unequal, acerose, entire, cobwebby, the longer ones 2 to 3 times as long as the calyx-tube; corolla minute (1¼ to 2 lines long), pinkish or purplish, sometimes whitish; stamens included in corolla-throat; capsule-cells 2 to 4-seeded.

Sandy flats and borders of meadows or dry openly forested slopes and ridges, abundant but inconspicuous, often forming dense colonies: Sierra Nevada, 3500 to 8200 feet, from Tulare Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges, 1000 to 5500 feet, from Trinity and Humboldt Cos. to western Siskiyou Co. North to southern Oregon. July.

Locs.—Sierra Nevada: near Cahoon Mdw., Tulare Co., *Jepson* 722; Huntington Lake, *Jepson* 12,980; Lake Merced, above Yosemite, *Jepson* 4422; Hazel Green, Mariposa Co., *Jepson* 15,047; Dorrington, Calaveras Co., *Jepson* 21,105; Silver Valley, Alpine Co., *Jepson* 10,092; Bear Valley, Nevada Co., *Jepson* 15,046; Bucks Valley, Plumas Co., *Jepson* 10,644; betw. Deadwood Ravine and Rich Gulch, Plumas Co., *Follett* 93; Chico Mdws., Butte Co., *Heller* 11,499; Davis Creek, Warner Mts., *R. M. Austin* 308; Fowlers Camp, McCloud River, se. Siskiyou Co., *Jepson* 20,068. North Coast Ranges: Soldier Ridge, Yollo Bolly Mts., *Jepson* 15,044; South Fork Mt., e. Humboldt Co., *Tracy* 9065; Horse Mt., Humboldt Co., *Tracy* 9119; Corral Prairie, Trinity Summit, *Tracy* 10,395; Woolly Creek (head of), w. Siskiyou Co., *Butler* 104.

Habit note.—In its most well-developed and characteristic form Navarretia divaricata is markedly proliferous. The main stem is usually short (¼ to ½ inch high, rarely 2 inches) and terminated by a head of flowers with several divaricate or ascending branches proliferating from beneath this primary head. The branches are each in turn terminated by a head with 1 to 4 branches proliferous from beneath the secondary heads, these latter branches again ending in a head or cluster of heads. The branches are markedly slender. A coarser form is as follows:

Var. **vividior** Jepson & Bailey var. n. Plants a little coarser and larger, 2 to 7 inches high; bracts and calyces glandular-puberulent; body of heads denser, 5 to 7 lines broad; corolla or its lobes blue; capsule-cells 3 to 6-seeded.—(Plantae crassiores majoresque, 2–7 unc. altae; bracteae et calyces glanduloso-puberulentes; capitula densiora; corolla azurea; capsulae loculi 3–6-spermi.)—Sandy flats and brushy mountain slopes, 1000 to 3500 (or 6000) feet: North Coast Ranges from western Shasta Co. to Lake Co.; Sierra Nevada from Modoc Co. to Butte Co.

Locs.—Castella, Shasta Co., *Condit;* Hyampum, Trinity Co., *Chesnut & Drew;* Van Duzen River Valley, opp. Buck Mt., *Tracy* 2721; Chamise Mt. (n. of Bell Sprs.), Mendocino Co., *Tracy* 13,326; Bartlett Sprs., n. Lake Co., *Jepson* 18,938; Mt. Hanna, sw. Lake Co., *Jepson* 15,045 (type). Sierra Nevada: Little Hot Springs Valley, sw. Modoc Co., *M. S. Baker;* Fall River Sprs., ne. Shasta Co., *Hall & Babcock* 4214; Sutton House, Butte Co., *R. M. Austin* 827.

Var. **peninsularis** (Greene) Jepson comb. n. Rachis of leaves about ½ line wide, its terminal segment entire or with a pair of short teeth; corolla 3 lines long.—Cismontane Southern California: Mt. Piños, n. Ventura Co., *Hall* 6615; Cuyamaca Mts., *T. Brandegee.*

Refs.—NAVARRETIA DIVARICATA Greene, Pitt. 1:136 (1887); Jepson, Man. 790 (1925). *Gilia divaricata* Torr.; Gray, Proc. Am. Acad. 8:270 (1870), type loc. "foothills of the Sierra Nevada," *Shelton* (the first named collector). *Gilia atrata* Jones, Contrib. W. Bot. 12:55 (1908), (type loc. Salmon Mdws., Ida., *Jones*), belongs here as to the plant cited from Soda Sprs. sta., Nevada Co., Cal., *Jones* 2465. Var. VIVIDIOR Jepson & Bailey, type loc. Mt. Hanna, sw. Lake Co., *Jepson* 15,045 (typ. in Herbario Jepsoniano). Var. PENINSULARIS Jepson. *N. peninsularis* Greene, Pitt. 1:136 (1887), type loc. Hanson ranch, n. L. Cal., *Orcutt* 1113 (isotyp. vidi).

17. **N. breweri** Greene. Stem branched into very short branches ending in capitate clusters, thus forming a usually dense or congested plant 1 to 3½ (or 6) inches high and commonly as broad; herbage puberulent; leaves pinnately divided, 4 to 7 lines long, the 5 or 7 divisions acicular, subulate or lanceolate, sometimes the divisions replaced by unequal bipartite or tripartite divisions; bracts with tripartite divisions; calyx-teeth subulate, entire, twice as long as the tube, exceeding the corolla; corolla yellow, sometimes white, subsalverform, 2½ to 3½ lines long; stamens exserted, the filaments inserted at base of corolla-throat; style 3-cleft; capsule-cells 1 or 2-seeded.

Montane valleys or flats, 4000 to 10,200 feet: easterly summits or easterly slopes of the Sierra Nevada from Inyo Co. to Modoc Co.; White Mts. North to eastern Oregon and Idaho, east to Wyoming and Colorado. June-July.

Locs.—Sierra Nevada: Cottonwood Creek, w. Inyo Co., *Jepson* 5069; Pickle Mdws., West Fork Walker River, Mono Co., *Ottley* 1125; Fales Hot Sprs., Alpine Co., *Ottley* 1039; Boca, e. Nevada Co., *K. Brandegee;* Sierra Valley, Sierra Co., *Lemmon;* Susanville, *T. Brandegee;* Big Valley, Modoc Co., *M. S. Baker;* Willow Creek Valley, Modoc Co., *R. M. Austin.* White Mts.: Silver Cañon, near Big Prospector Mdw., *Jepson* 7346.

Refs.—NAVARRETIA BREWERI Greene, Pitt. 1:137 (1887); Jepson, Man. 790 (1925). *Gilia breweri* Gray, Proc. Am. Acad. 8:269 (1870), type loc. Ebbets Pass, Alpine Co. (first named locality), *Brewer.*

18. **N. squarrosa** H. & A. SKUNKWEED. Stem erect, branching at or above the base, 8 to 16 inches high; herbage pubescent and noxiously glandular; leaves ½ to 1½ inches long, once or twice pinnatifid, the rigid segments lanceolate and often crowded; calyx 5 to 6 lines long, thinly villous (especially on the lobes), the tube broadly scarious between the ribs, the lobes lanceolate and pungent, usually entire, a little longer than the tube; corolla blue, sometimes very pale, 5 to 6 lines long, little or scarcely at all exceeding the calyx; stamens included in corolla-throat, the filaments unequal (½ to 1 line long), unequally inserted about middle of corolla-tube, the longer usually inserted higher; capsule many-seeded, the seeds small, 8 to 14 in each cell.

Dry clay or sandy flats in valleys and on cañon floors and opens in forest, 20 to 2300 feet: Coast Ranges (mostly the outer and middle ranges) from Monterey Co. to Del Norte Co.; northern Sierra Nevada foothills from Amador Co. to Eldorado Co. North to British Columbia. June-Aug.

Field note.—A vegetatively vigorous type, Navarretia squarrosa, in branching, in foliage and in calyces, is somewhat distinctively marked and in consequence readily known by its field habit. It is of frequent occurrence. In early stages of growth, as found in the beds of former shallow winter pools, the aspect is curiously like that of young Centromadia pungens (Hemizonia pungens). For the virility of this species there is some evidence: it has emigrated to the state of Victoria, Australia, where it is now an established weed.

Locs.—Coast Ranges: Monterey, *Jepson* 20,947; Pajaro Hills, *Chandler* 467; Wrights sta., Santa Cruz Mts., *Elmer* 5009; Niles, *Nutting;* Oakland Hills; Pt. Reyes, *Davy* 6816; York Creek, St. Helena, *Jepson* 2353; Cobb Mt., sw. Lake Co., *Jepson* 20,942; Mt. Konocti, *Hoover* 3813; Blue Lakes, nw. Lake Co., *Jepson* 20,944; Low Gap, Mendocino Co., *Jepson* 2236; Albion, Mendocino coast, *Jepson* 17,684; Willits, *Jepson* 16,373; Laytonville, *Jepson* 9320; Englewood, lower Eel River, *Constance* 931; Table Bluff, Humboldt Co., *Tracy* 14,103; Dows Prairie, Humboldt Co., *Tracy* 5857; Big Lagoon, Humboldt coast, *Jepson* 9416; Elk Valley, e. of Crescent City, *Tracy* 15,483; Gilbert Creek, nw. Del Norte Co., *Jepson* 9353. Sierra Nevada: Ione, Amador Co., *Braunton* 1136; Sweetwater Creek, Eldorado Co., *K. Brandegee.* The var. agrestis Brand has 3 of the calyx-lobes with 1 or 2 spinose teeth near apex; it is not otherwise different.—Mt. Davidson, San Francisco, *Jepson* 10,595; San Mateo Co. Spinose calyx-lobes or the lack of them is so frequently a weak, a variable or immaterial character in Navarretia that occurrence of spinose calyx-lobes in N. squarrosa is to be expected anywhere within the range of the species (as at Englewood, main Eel River).

Refs.—NAVARRETIA SQUARROSA H. & A., Bot. Beech. 368 (1838); Jepson, Man. 790 (1925). *Hoitzia squarrosa* Esch., Mem. Acad. St. Petersb. ser. 6, 10:282 (1826), type loc. "in Novae Californiae arenosis" (probably at San Francisco), *Eschscholtz. Gilia squarrosa* H. & A., Bot. Beech. 151 (1833). *G. pungens* Dougl.; Hook., Bot. Mag. t. 2977 (1830), type loc. "mountain valleys near source of the Multnomack [Willamette] River," s. Ore., *Douglas. Aegochloa pungens* Benth., Bot. Reg. sub t. 1622 (1833). *Navarretia pungens* Hook., Fl. Bor. Am. 2:75 (1838). *N. pterosperma* Eastw., Bot. Gaz. 37:445 (1904), type loc. Bodega Pt., Sonoma Co., *Eastwood;* depauperate individuals 1¼ to 2 inches high (typ. vidi). *N. squarrosa* var. *agrestis* Brand; Engler, Pflzr. 4^{250}: 159 (1907).

19. **N. mellita** Greene. Stem slender, diffusely branching from the base or sometimes subsimple and erect, often reddish, 3 to 6 (or 13) inches high; herbage bright green, glandular-villous; leaves ⅓ to 1¼ inches long, pinnately parted into linear-subulate entire or toothed segments; bracts dilated and laciniately toothed or cleft into narrow divisions, or the middle division ovate, abruptly cuspidate and often entire; heads small, 4 to 6 (or 10) lines broad; calyx equaling or exceeding

the corolla, its lobes 2 to 3 times as long as the calyx-tube; corolla very slender-funnelform, very pale blue or white, 2½ to 3 lines long; stamens included in corolla-tube, the filaments very short (⅙ to ¼ line long), equally or somewhat unequally inserted below middle of corolla-tube; capsule-cells 6 to 12-seeded.

Dry hills and flats, 200 to 3500 feet: Coast Ranges from Humboldt Co. to San Luis Obispo Co. July.

Locs.—Mail Ridge (5 mi. s. of Harris), Humboldt Co., *Tracy* 13,333; Bennett Spr., w. Glenn Co., *Heller* 11,538; South Mill Creek (head of), se. of Ukiah, *Jepson* 3018; Cache Creek bridge, 2 mi. n. of Lower Lake, *Jepson* 18,907; Kelseyville, Lake Co., *Jepson* 20,950; Reiff, Knoxville Ridge, *Jepson* 19,002; Calistoga, *Greene;* Gates Cañon, Vaca Mts., *Jepson* 20,952; Mt. Diablo, *Bowerman* 910; Moraga Pass, Oakland Hills, *Davy;* Black Mt., Santa Clara Co., *Pendleton* 1475; Pajaro Hills, Monterey Co., *Chandler* 377; Burro trail, Santa Lucia Mts., *K. Brandegee;* Santa Lucia Mts. n. of San Luis Obispo, *Palmer* 410.

Refs.—NAVARRETIA MELLITA Greene, Pitt. 1:134 (1887); Jepson, Man. 790 (1925). *Gilia mellita* Greene, Pitt. 1:71 (1887), type loc. Belmont, San Mateo Co., *Greene;* Jepson, Fl. W. Mid. Cal. ed. 1, 428 (1901), ed. 2, 333 (1911). *N. eastwoodiae* Brand; Engler, Pflzr. 4^{250}:157 (1907), type loc. Mt. Tamalpais, *Eastwood* 872 (isotyp. vidi).

20. **N. heterodoxa** Greene. Stem slender, erect, branching, rarely simple, 4 to 11 inches high, the internodes long; herbage slightly glandular-puberulent; leaves ½ to 1¼ inches long, the lower with narrowly linear or filiform rachis and few or several pinnate short-subulate segments towards the base (or the lowermost often entire); uppermost leaves lanceolate and entire except at the laciniately toothed base; bracts lanceolate to broadly ovate, laciniate-toothed towards the base; calyx-segments entire, nearly equal; corolla blue, 5 lines long, with exserted declined stamens, the filaments inserted on base of throat; capsule-cells 2 to 6-seeded, the seeds small.

Dry hillslopes and summits, back of the coast, 500 to 1500 feet: Coast Ranges from Sonoma and Napa Cos. to Santa Clara Co. June-Aug.

Locs.—Petrified Forest, e. Sonoma Co., *Jepson* 20,959; Hope Valley, Sonoma Co., *M. S. Baker* 3041b; Hoods Peak, *Michener & Bioletti;* Rebecca ranch, se. of Calistoga, *Jepson* 20,962; Howell Mt., Napa Range, *Jepson* 1731; Napa Soda Sprs., ne. of Napa, *Jepson* 20,960; Adobe Creek, near Black Mt., Santa Clara Co., *Pendleton* 1483; Eva sta., e. slope Santa Cruz Mts., *Jepson* 20,961; New Almaden, *Davy* 380.

Var. **rosulata** (Brand) Jepson comb. n. Stamens included.—Marin Co. (betw. West Point and Willow Camp, Mt. Tamalpais, *K. Brandegee;* Big Carson, *Eastwood*); San Mateo Co.

Refs.—NAVARRETIA HETERODOXA Greene, Pitt. 1:134 (1887); Jepson, Man. 791 (1925). *Gilia heterodoxa* Greene, Bull. Cal. Acad. 1:10 (1884), type loc. Calistoga (hills w.), *Greene;* Jepson, Fl. W. Mid. Cal. ed. 1, 428 (1901), ed. 2, 333 (1911). *G. viscidula* var. *heterodoxa* Gray, Syn. Fl. ed. 2, 2:409 (1886). *G. parvula* Greene, Pitt. 1:72 (1887), type loc. Crystal Sprs., San Mateo Co., *Greene. N. parvula* Greene, Pitt. 1:134 (1887). Var. ROSULATA Jepson. *N. rosulata* Brand; Engler, Pflzr. 4^{250}:154, fig. 34 G–J (1907), type loc. San Anselmo, Marin Co., *Eastwood. N. fallax* Brand, l.c. 156 (1907), type loc. Belmont Lake, San Mateo Co., *Abrams* 2998.

21. **N. atractyloides** H. & A. Stems freely branched, stoutish, 2 to 8 (or 11) inches high, the branches short and spreading or procumbent; herbage villous-pubescent, more or less glandular, often somewhat purplish; leaves rigidly coriaceous, ½ to 2¼ inches long, the main body or rachis oblong-lanceolate to ovate or linear, (1 or) 2 to 4 lines broad, the margin armed with subulate or aristate teeth or spines, the teeth or spines mostly remote or discrete; bracts similar to the leaves, very coriaceous and saliently spiny; calyx-lobes moderately unequal to very unequal, ovate to lanceolate, cuspidate, entire (or rarely some of the calyces with the larger lobes 3-toothed); corolla narrowly funnelform, purple, sometimes white or yellow, 7 to 9 lines long; stamens included in or shortly exserted from corolla-throat; capsule-cells 4 to 10-seeded.

Dry rocky or clay hills or sandy valleys, 20 to 1500 (or 4000) feet: Coast Ranges from Humboldt Co. to San Luis Obispo Co.; San Joaquin Valley from eastern Contra Costa Co. to Madera Co.; coastal Southern California. July.

Note on variation.—While generally regarded as a variable unit Navarretia atractyloides as here conceived, sensu lato, is marked by certain fairly constant boundaries: (a) Its habit is uniform in essentials, although the short branches are sometimes much congested. (b) It varies slightly in villosity; a state slightly more villous than the usual form is Navarretia hirsutissima Brand. No form of Navarretia atractyloides is, however, set off by a distinctive pubescence character. (c) The corolla is usually purple, though occasionally white or yellow (var. flavida Jepson), which are not exceptional color variations amongst Polemoniaceous annuals. (d) The leaf develops marked eccentricities but the eccentricities lie within the limits of a fairly definite type. The leaf may vary much in one particular, namely in breadth, even on one individual; the body or rachis varies from 1 to 4 lines in breadth and bears fine or coarse teeth or lobes, or it may be filiform with filiform lobes; but with all this the subulate or aristate or lanceolate or spiny lobes follow a rather constant pattern. A special leaf form is discussed below. The preponderance of fundamental resemblances and the unimportant character of differences makes Navarretia atractyloides one unit as here described.

Locs.—Coast Ranges: Hupa, n. Humboldt Co., *Davy* 5870; Trinity River Valley near the South Fork, *Tracy* 7206; Hyampum, Trinity Co., *Chesnut & Drew;* Epperson road sta., Bear Valley, sw. Colusa Co., *K. Brandegee;* Kelseyville, Lake Co., *Jepson* 15,028; Santa Cruz (n. of), *Jepson* 9778; Gilroy (w. of), *Jepson* 21,018; Monterey, *Jepson* 21,017; San Miguelito rancho, Jolon, *Jepson* 1627; Santa Margarita, *Condit;* San Luis Obispo, *Jared.* San Joaquin Valley: Antioch, *K. Brandegee;* Madera, *Buckminster.* Coastal S. Cal.: Santa Rita sandhills, Lompoc, *Condit;* Water Cañon, Santa Rosa Isl., *Hartwell* 791; Prisoners Harbor, Santa Cruz Isl., *Jepson* 12,076; betw. Glendale and Burbank, *Braunton* 898; Claremont, *Chandler;* San Bernardino, *Parish* 2001; Ramona, n. San Diego Co., *K. Brandegee;* Dulzura, San Diego Co., *Howell* 2966; Witch Creek, San Diego Co., *Alderson.*

A marked but inconstant leaf form is var. HAMATA (Greene) Jepson: leaves mostly small, the rachis varying from filiform to 1 line broad with spreading spines, the three terminal spines divaricate or often spreading horizontally.—It occurs within the range of the species as follows: Judsonville, Contra Costa Co., *K. Brandegee;* Pacific Grove, *Heller* 6782 (passing into the ordinary form); Oak Park, San Luis Obispo, *E. P. Unangst;* San Marcos Pass, Santa Ynez Mts., *Hoffmann;* Santa Catalina Isl., *T. Brandegee;* Rainbow, San Diego Co., *Parish* 4466; Escondido, *Chandler* 5353; Del Mar, San Diego Co., *Jepson* 1609; San Diego, *Orcutt* 1454. The two first cited specimens show leaf forms intermediate to the usual leaf form. Plants from the Pajaro Hills, n. Monterey Co., *Chandler* 378, exhibit both the leaf types usual to N. atractyloides and that leaf type characteristic of var. hamata, even on one individual. The plants from this station are worthy of comment in that the ovate spiny-margined base of the leaf is contracted at apex into a narrow peduncle-like process which bears at apex a circle of 3 horizontally divergent spines equally spaced. So much for the variable var. hamata. Contrariwise, collections referable to N. atractyloides may bear occasional leaves with the shape and spine-pattern of var. hamata.

Refs.—NAVARRETIA ATRACTYLOIDES H. & A., Bot. Beech. 368 (1840); Jepson, Man. 791 (1925). *Aegochloa atractyloides* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas. Gilia atractyloides* Steud., Nom. Bot. ed. 2, 1:683 (1840); Jepson, Fl. W. Mid. Cal. 428 (1901), ed. 2, 333 (1911). *N. foliacea* Greene, Pitt. 1:138 (1887), type loc. San Diego, *Orcutt. N. atractyloides* var. *foliacea* Jepson, Man. 791 (1925). *N. hirsutissima* Brand in Engler, Pflzr. 4^{250}:153 (1907), type from Cal., *Palmer* 409½, and *N. macrantha* Brand, l.c. 154 (1907), type loc. between Foster and Ramona, San Diego Co., *Abrams* 3765, are perhaps other synonyms. *N. atractyloides* var. *flavida* Jepson, Man. 791 (1925), type loc. North Fork San Gabriel River, *Peirson.* Var. HAMATA Jepson, Man. 791 (1925). *N. hamata* Greene, Pitt. 1:139 (1887), type loc. Guadalupe Mt., L. Cal., *Orcutt.*

22. **N. viscidula** Benth. (Fig. 377.) Stem erect, divaricately or somewhat proliferously branched, sometimes spreading or subprostrate, sometimes dwarfish and simple, 1 to 8 (or 10) inches high; herbage viscid-pubescent; leaves ¼ to 2½ inches long, narrow, the lower with slender or filiform rachis and remote filiform lobes, the upper with broader rachis and remote short-subulate lobes; bracts little dilated, palmately parted, the lobes incisely toothed or entire, or ovate with 1 or 2 laciniate teeth on each side; calyx-lobes entire (very rarely the longer lobe with one tooth), the longer lobes as long or longer than the calyx-tube; corolla blue-purple or rose-purple, rather large (5 to 7 lines long), 1½ to 2 times as long as the calyx, the limb 2 lines broad, its lobes elliptic; stamens exserted from corolla-throat; capsule-cells 1 to 6-seeded.

Rocky slopes, sandy flats or sun-baked clays of low hills, plains or valleys, 100 to 2100 feet: North Coast Ranges, mostly back of the coast, from Humboldt Co. to western Solano Co. and Marin Co.; Contra Costa Co.; Sacramento Valley, mostly on its rolling plains; Sierra Nevada foothills from Shasta Co. to Tulare Co. and the bordering rolling margins of the Great Valley plains. May-Aug.

Biol. note.—Variability in branching or the lack of it characterizes Navarretia viscidula to some considerable degree. Most commonly it is 3 to 5 inches high and divaricately branched, though sometimes the stem is simple. Under favorable soil conditions this divaricate type of branching becomes highly developed, as on the rich loam soil of alluvial fans at mouths of cañons. In such habitats luxuriant states are produced; the stems are several from the base, widely divergent or decumbent and form plants 10 to 15 inches broad, with peduncle-like divaricate branches terminating usually in a single head. Plants of this sort (Gates Cañon, Vaca Mts., *Jepson* 15,033) in habit and aspect recall vigorous plants of Trifolium tridentatum.

Under unfavorable moisture and soil conditions of a given season, extensive colonies are reduced to dwarfs 1 or 2 inches high with a single unbranched axis and one terminal head of flowers. The rolling foothills between Valley Springs and Burson, Calaveras County, provide a characteristic habitat for this dwarf state, which, in the latter half of May, occurs so abundantly on the very hard gravelly red soil as to impart a red-purple flush to the country—a vegetation stand all the more marked since usually consisting, at this season, of only this species.

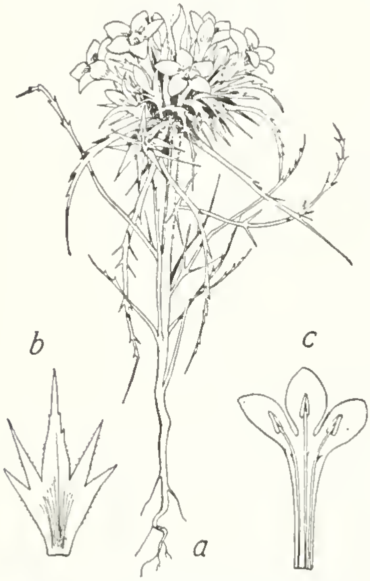

Fig. 377. NAVARRETIA VISCIDULA Benth. *a*, habit, × 1; *b*, bract, ×2; *c*, long. sect. of fl., × 2.

Locs.—Coast Ranges: Alder Point, Humboldt Co., *Tracy* 4732; White Thorn Valley, s. Humboldt Co., *Tracy* 5036; betw. Potter Valley and Travelers Home, Mendocino Co., *Jepson* 20,954; Windsor, Sonoma Co., *Jepson* 9298; St. Helena, *Jepson* 2347; Gates Cañon, Vaca Mts., *Jepson* 15,033; Cordelia, w. Solano Co., *Jepson* 1741; Shellville, s. Sonoma Co., *Bioletti;* Ross Valley, Marin Co., *Jepson* 15,029. Contra Costa Co.: Walnut Creek, *Greene.* Sacramento Valley: Hawes ranch, lower Cow Creek, Shasta Co., *Blankinship;* Cottonwood, Shasta Co., *Howell* 12,232; Jellys Ferry, Tehama Co., *Jepson* 18,981; Chico (5 mi. n.), *Heller* 11,427; Cannon sta., Solano Co., *Jepson* 15,034. Sierra Nevada foothills and the near borders of the Great Valley plain: Auburn, Placer Co., *K. Brandegee;* betw. Salmon Falls and Pilot Hill, Eldorado Co., *K. Brandegee;* Ione, Amador Co., *Hoover* 2422; Burson, Calaveras Co., *Jepson* 9938; Columbia, Tuolumne Co., *Chesnut & Drew;* La Grange, Stanislaus Co., *Jepson* 15,030; Snelling, Merced Co., *Hoover* 592; Sanger, Fresno Co., *Condit;* Rogers Valley, n. of Auberry, Fresno Co., *Jepson* 12,880; Sand Creek Valley, e. of Orange Cove, Tulare Co., *Hoover* 2580; Watson Spr., North Fork Kaweah River, *Jepson* 583; Middle Tule River, Tulare Co., *Purpus* 5612.

Refs.—NAVARRETIA VISCIDULA Benth., Pl. Hartw. 324 (1848), type loc. "in montibus Sacramento" (that is, undoubtedly, in n. Sierra Nevada foothills), *Hartweg* 388; Jepson, Man. 791, fig. 770 (1925). *Gilia viscidula* Gray, Proc. Am. Acad. 8:271 (1870); Jepson, Fl. W. Mid. Cal. 429 (1901), ed. 2, 333 (1911). *N. purpurea* Greene; Brand in Engler, Pflzr. 4^{250}:156 (1907), type loc. Middle Fork, Amador Co., *Hansen* 130. *N. viscidula* var. *purpurea* Jepson, Man. 792 (1925). (?) *N. macgregorii* Brand, Ann. Conserv. et Jard. Bot. Genève 15–16:339 (1913), type loc. Water Cañon, Tehachapi Mts., *Abrams & McGregor* 498; teeth of bracts hyaline-margined; calyx-tube hyaline (ex char.).

5. **HUGELIA** Benth.

Herbs lanate when young, not at all glandular. Leaves or their simple divisions linear or filiform and rigid. Flowers crowded into capitate leafy-bracted clusters. Bracts 3 to 5-cleft, these and the calyces densely woolly-matted. Calyx-lobes subulate, pungent. Corolla salverform. Stamens commonly exserted; anthers deeply sagittate. Capsule many-seeded or in some species 3 to 6-seeded. Seed-coats changing under water.—Species 9, western North America. (Baron Charles de Hugel of Vienna.)

Tax. note.—The genus Hugelia Benth. was published in the Botanical Register (sub t. 1622) in 1833. It has a prior homonym in Hugelia Reichenb., a genus of Umbelliferae, published in Reichenbach's Conspectus Regni Vegetabilis in 1828 and now referred to Didiscus by Engler and Prantl (Nat. Pflzfam. 3^{8}:120,—1898). The only other name available for this Polemoniaceous genus is Welwitschia Reichenb. (1837), but its homonym, Welwitschia Hook. (1862), has been conserved under the International Rules of Nomenclature for a South African Guetaceous genus (also known as Tumboa Welw., 1861). See Nomina Conservanda List, Kew Bull. 1921:326. Hugelia Benth. is, therefore, the only published name at present available for designating this Polemoniaceous genus and its inclusion in the next Nomina Conservanda supplement to the International Rules of Botanical Nomenclature is expected.

Perennial (woody-based); corolla 2 to 3 times longer than calyx; South Coast Ranges and s. Sierra Nevada to S. Cal.......1. *H. densifolia.*
Annuals.
Anthers ¾ to 1 line long, strongly sagittate, well-exserted from corolla-throat; corolla bright blue or yellow.
Stamens inserted in sinuses of corolla; corolla-tube 2 to 3 times as long as calyx; San Joaquin Valley and bounding ranges and w. Mohave Desert.......2. *H. pluriflora.*
Stamens inserted at base of corolla-throat; corolla-tube about as long to 2 times as long as calyx.
Corolla bilabiate, the tube 1¼ to 2 times as long as calyx; stamens unequal; heads terminal on the branchlets of the diffusely or dichotomously branched plants; leaves pinnately 3 to 7-cleft; outer bracts mostly pinnately 3 to 5-cleft.......3. *H. eremica.*
Corolla regular, the tube about as long as the calyx; stamens subequal; heads mostly racemosely disposed, sometimes corymbose, 2 to 6 lines broad; leaves filiform, entire or with only 1 (rarely 2) pair of lobes at the base; outer bracts palmately 3 to 5-cleft.
Corolla yellow; Monterey Co. to Orange Co., near coast line.......4. *H. lutea.*
Corolla dark-blue, the throat yellow; Monterey Co. to cismontane S. Cal. and Mohave Desert.......5. *H. virgata.*
Anthers ¼ to ½ line long, oval or not conspicuously sagittate, mostly included or only shortly exserted from corolla-throat; corolla light-blue to white, its tube not exceeding the calyx, its lobes ¼ to ½ as long as corolla-tube and throat.
Corolla 3½ to 7 lines long, the throat yellowish.
Plants erect, the stems white-tomentulose or glabrate; bracts mostly straight; corolla 1¼ to 1½ times as long as calyx; widely distributed, both cismontane and transmontane.......6. *H. filifolia.*
Plants diffusely or divaricately branched, the stems wiry, red-brown, glabrous; bracts or their lobes curved; corolla little or not at all exceeding calyx; Mohave and Colorado deserts.......7. *H. diffusa.*
Corolla 2 to 3 lines long, the throat not yellowish.
Corolla pure white, bilabiate or regular; bracts dull green, tomentose below; leaves entire; San Joaquin Valley.......8. *H. hooveri.*
Corolla white or pale blue, not bilabiate; bracts bright intense green (contrasting strongly with the white matted wool on lower part); leaves pinnately 3 to 5-divided; Lake Co. and Santa Cruz Mts.......9. *H. abramsii.*

1. **H. densifolia** Benth. Stems many, tufted on a much-branched woody root-crown, erect, simple or branched above, 5 to 14 inches (or 2 feet) high; herbage lanate-tomentose when young, glabrate in age; leaves ¼ to 2¼ inches long, the rachis or body narrowly linear, bearing 1 to 3 (or 5) pairs of lobes, the lobes lanceolate or short-subulate, spinulose-tipped, sometimes the rachis with only a single pair or two pairs of lobes towards the base (the upper elongated linear or linear-lanceolate part of the leaf thus entire), rarely the leaf wholly entire; flowers in dense terminal clusters, the clusters variable in size but often markedly capitate (¼ or ½ to 1½ inches broad), the foliaceous bracts and the calyces implexed-woolly; corolla deep blue, 5 to 10 lines long, its lobes oblong, 2 to 2½ lines long.

Dry chaparral slopes or mesas or sandy flats, 1000 to 7000 (or 8500) feet: south Coast Ranges from Santa Clara Co. to San Luis Obispo Co.; cismontane Southern California from Santa Barbara Co. and northern Ventura Co. to San Diego Co.; Tehachapi Mts.; southern Sierra Nevada in Kern and Inyo Cos. South to Lower California. June-Sept.

Note on variation.—Hugelia densifolia represents an unstable aggregate. There is much variation in habit, in persistence of pubescence, in leaf lobation and in size of the flower heads, the range in size of heads being to a considerable degree associated with the degree of branching. The leaves vary in length and in width of rachis and as to the number, position and discreteness of the lobes and size of the lobes. The coast line of San Luis Obispo and Santa Barbara counties is the habitat of a form of the species with non-rigid leaves: the rachises of the leaves are very narrow (¼ to ⅓ line wide), especially on the basal leaves, and the 1, 2 or 3 pairs of lobes are mostly set below the middle or sub-basal. Sometimes the lobes are reduced to one tooth-like sub-basal pair, or again the leaves may be quite entire. A conspicuous feature is the fascicles of short leaves in the axils along the stems. This form of the coast line corresponds fairly well to a specimen collected by David Douglas, a part of the original Douglas collection of Hugelia densifolia made in California (Herb. Univ. Cal., the contemporaneous label bearing the citation "Bot. Reg. t. 1622" and "Hort. Soc. 1833"). Douglas was sent to California by the London Horticultural Society. He journeyed by land from Monterey to Los Angeles and although he doubtless made an expedition to the inner Coast Range, it is probable, indeed practically certain, that the type of Hugelia densifolia was collected by him along the coast line. Coast line collections of this typical form from San Luis Obispo Co. to Santa Barbara Co. may be cited: Morro, *Roadhouse;* Santa Maria, *Blochman;* Lompoc, *Hoffmann.* In the Blochman collection (as occasionally in this coast line form), flowers or flower heads are developed on short branchlets arising from the buds of the axillary fascicles (thus simulating H. virgata). There is, however, in coast line forms every shade of intergrade from the form with the leafy fascicles just described to a form with weak buds in the leaf-axils or with naked axils. The form with weak axillary fascicles corresponds to the Douglas collection described by Bentham under the name Hugelia elongata, as evidenced by a Douglas collection (Univ. Cal. Herb., contemporaneous label, with citation of "Bot. Reg. 1622" and "Hort. Soc. 1833"). This form is in reality a part of a series and is in this sense indistinguishable from the coast line form with axillary leaf fascicles and occasional small lateral heads as noted above, which chances to represent the botanical or formal type. The presence of lateral as well as terminal flower clusters is not significant, since such a condition may break out at various interior stations of the "elongata" form (Banning, *Gilman* 746); such plants differ only slightly from the "elongata" form. Moreover, a terminal head is sometimes replaced by a corymbose cluster of small heads which approximates in form the development of lateral heads from lateral leafy buds. In the "elongata" form 1 or 2 pairs of lobes are usually set below the middle of the leaf-rachis or sub-basally set, with the terminal lobe or rachis much elongated, entire and gladiate. The range of the species may be validated as follows. South Coast Ranges: mts. of Santa Clara Co. (Greene, Man. Reg. S. F. Bay 249); Vancouver Pinnacles (6 mi. n.), San Benito Co., *Howell* 11,524; Tassajara road, Santa Lucia Mts., *Hall* 10,077; Callender, San Luis Obispo Co., *Cooper* 157; Estrella, San Luis Obispo Co., *Jared.* Cismontane S. Cal.: Casmalia, Santa Barbara Co., *Cooper* 244; Big Pine Mt., San Rafael Mts., *Hoffmann;* Mono Flat, upper Santa Inez River, *A. L. Grant* 1688; Cuddy Cañon, Mt. Piños, *H. & M. Dearing* 1383; Aliso Cañon, Santa Monica Mts., *Barber* 192; Mt. Wilson, *Peirson* 521; Mt. San Antonio, San Gabriel Mts., *Abrams* 2682; San Bernardino, *S. B. & W. F. Parish;* Santa Ana River near Redlands, *Parish;* Banning, *M. F. Gilman* 746; Saunder's Mdw., San Jacinto Mts., *C. V. Meyer* 622; Hemet Valley, San Jacinto Mts., *Orcutt;* Laguna Mts., *Cleveland;* Jacumba, San Diego Co., *Cleveland.* Ranges on south side Mohave Desert: Black Rock, near Warrens Well, *Epling & Robison;* Rock Creek, n. slope San Gabriel Mts., *Peirson* 482. Southern Sierra Nevada: Kern Co. (Greenhorn Summit, *C. N. Smith* 35; Pahute Peak, *Purpus* 5087; Onyx, *Voegelin*); Inyo Co. (Bishop, *Almeda Nordyke;* Kearsage Mill, *Jepson* 902; Independence, *Alice Rhine;* Hunters Flat, *Otto Renner* 66; Cottonwood Creek, near Timosea Peak, *Jepson* 5091).

Within the range of the species occur three phases described as varieties. All of these intergrade numerously to the usual form but each has some geographic significance, and intergradation is mainly on the borders and not within the limits of the most marked areal development in each case.

Var. **mohavensis** (Craig) Jepson comb. n. Plants low (3 to 11 inches high); herbage white-lanate; leaves ½ to 1 (or 2) inches long, with 1 to 3 pairs of tooth-like lobes; heads many to numerous.—Sandy flats or sand dunes, 2000 to 4000 feet: Inyo Co. (Independence); Mohave Desert (Kelso; Redrock Cañon; Muroc; Lancaster,—all acc. Bull. Torr. Club 64:392–3).

Var. **sanctarum** (Mlkn.) Jepson. Herbage and heads densely white-woolly; corolla longer (1 to 1¼ inches long).—San Bernardino Valley (San Bernardino, *Parish* 4178; Mill Creek, *Lemmon;* Santa Ana River betw. Redlands and Highlands, *F. M. Reed* 3107).

Var. **austromontana** (Craig) Jepson comb. n. Stems rather densely leafy; herbage mostly subglabrate; leaves mostly shorter than the prevailing form (½ to 1 inch long), the 2 to 4 pairs of lobes equally spaced on the rachis as a rule, the terminal lobe thus short.—Montane, 4000 to 6000 feet: Lake Arrowhead, San Bernardino Mts., *Braunton* 1065; San Jacinto Mts., *Gilman* 747; Dos Palmos Spr., near Pinyon Flat, Santa Rosa Mts., *Munz* 15,105; Palomar Mt., *Chandler* 5372; Laguna Mts., *Cleveland.*

Though there is, in a sense, so much of variation in this species group, it should be noted that variational differences have here been emphasized. The features common to this species are marked—so well marked as to unite the entire representation of it in one species unit with distinctive characteristics. It is seldom, indeed almost never, that a misdetermination is found in collections of Hugelia densifolia.

Refs.—HUGELIA DENSIFOLIA Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas;* Jepson, Man. 792 (1925). *Gilia densifolia* Benth.; DC., Prodr. 9:311 (1845); Jepson, Fl. W. Mid. Cal. 427 (1901), ed. 2, 332 (1911). *Navarretia densifolia* Brand; Engler, Pflzr. 4^{250}:165 (1907). *Gilia hugelia* Steud., Nom. Bot. ed. 2, 1:683 (1840). *H. elongata* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas.* *Gilia elongata* Steud., l.c. *G. densifolia* var. *elongata*

Brand, l.c. *Navarretia densifolia* subsp. *elongata* Brand, l.c. Var. MOHAVENSIS Jepson. *Gilia densifolia* var. *mohavensis* Craig, Bull. Torr. Club, 61:392 (1934), type loc. betw. Rosamond and Mohave, *Craig* 1360. Var. SANCTARUM Jepson, Man. 792 (1925). *Gilia densifolia* var. *sanctarum* Mlkn., Univ. Cal. Publ. Bot. 2:39 (1904), type loc. Santa Ana River near Riverside, *Hall* 683. *G. densifolia* var. *longiflora* Gray, in herb. Var. AUSTROMONTANA Jepson. *Gilia densifolia* var. *austromontana* Craig, l.c. 61:391, type loc. Nellie, Palomar Mt., *Munz* 8341. *Hugelia densifolia* subsp. *austromontana* Ewan, Bull. Torr. Club 64:520 (1937).

2. **H. pluriflora** Ewan. Stem erect, mostly simple below and branched above, 5 to 9 inches high; leaves ¾ to 1¼ inches long, shortly petioled or subsessile, pinnately divided into 3 to 7 filiform or subulate segments, the segments remote; heads few to many, densely tomentose, (¼ or) ½ to mostly 1 inch broad; bracts pinnately divided; calyx-lobes inconspicuously margined; corolla almost salverform or the tube slightly funnelform, vivid blue, 6 to 9 lines long, its tube and throat 2 to 4 times as long as calyx, hairy on the inside; corolla-throat blue or yellow; stamens inserted in the corolla-sinuses, exserted from throat.

Sandy flats in the valleys and mountains, 100 to 6000 feet: San Joaquin Valley plain and its bordering foothills and ranges, that is, inner South Coast Range from Alameda Co. to northeastern Santa Barbara Co., Sierra Nevada (mostly in the foothills) from Mariposa Co. to Kern Co., and Tehachapi Mts.; western Mohave Desert. May-Aug.

Locs.—South Coast Ranges: Corral Hollow, e. Alameda Co., *Brewer* 1212; Cholame Valley, se. Monterey Co., *Lemmon;* Estrella, San Luis Obispo Co., *Jared;* Carrizo plain, se. San Luis Obispo Co., *Keck* 2808. Santa Barbara Co.: upper Cuyama Valley, *Munz* 11,416. San Joaquin Valley: betw. Mossdale School and Atlanta, *Jepson* 15,048; Livingston, Merced Co., *Congdon;* Kettleman plain, Kings Co., *Jepson* 12,172; Edison, Kern Co., *Hoover* 666; Taft, Kern Co., *Hoffmann.* Sierra Nevada: Mariposa, *Dodd;* betw. Huntington Lake and Cascada, *A. L. Grant* 1397; Big Creek, Fresno Co., *Jepson* 13,121; Dunlap, s. Fresno Co., *Eastwood;* betw. Halstead ranch and Davis ranch, North Fork Kaweah River, *Jepson* 567; Alder Creek, Tulare Co., *W. Fry* 342; upper Grouse Valley, Tulare Co., *Jepson* 4712; Middle Tule River, *Purpus* 1355; Poso Creek, Greenhorn Mts., Kern Co., *C. N. Smith* 191. Tehachapi Mts.: near Caliente, *Davy* 1939; Ft. Tejon, *Parish* 1897. Mt. Piños region: Ballinger Cañon, ne. Santa Barbara Co., *H. & M. Dearing* 1384. Western Mohave Desert: Lancaster, *K. Brandegee.*

Refs.—HUGELIA PLURIFLORA Ewan, Bull. Torr. Club 64:520 (1937). *Gilia pluriflora* Hel., Muhl. 2:113 (1906), resting on *G. virgata* var. *floribunda* Gray, Proc. Am. Acad. 8:272 (1870), type from Cal., *Fitch;* Jepson, Fl. W. Mid. Cal. 426 (1901), ed. 2, 331 (1911). *Navarretia virgata* var. *floribunda* Brand; Engler, Pflzr. 4^{250}:168 (1907). *Gilia brauntonii* Jepson & Mason, in Jepson, Flora of the Econ. Plants Cal. 130 (1924), resting on Gilia virgata var. floribunda Gray. *Hugelia brauntonii* Jepson & Mason, in Jepson, Man. 793 (1925). For Gilia virgata var. floribunda, Gray mentions three collectors, but the collection of Fitch as the first cited, may well be taken as the type. During the 1870s and later Fitch collected at various places in central California. He was for some time at Stockton, near which place, in that early day, the plant described by Gray as Gilia virgata var. floribunda was abundant. The plant called *Gilia sherman-hoytae* Craig (Bull. Torr. Club 61:415,—1934), type loc. 10 mi. s. of Muroc, w. Mohave Desert, *Munz & Craig* 12,925 (isotyp. vidi), is not distinguishable by any definite character from Hugelia pluriflora. Variation in size of flower heads is continuous. The type of Gilia sherman-hoytae consists mostly of unbranched plants which seem to represent a depauperate phase of Hugelia pluriflora.

3. **H. eremica** Jepson. Stems many from the base, diffusely and often dichotomously branched, 4 to 6 inches high; leaves 5 to 9 lines long, pinnately divided into (3 or) 5 to 7 short linear lobes, or the short lateral lobes approximate and subbasal with the terminal lobe elongated; heads small, numerous, 2 to 5 lines broad, densely woolly; outer bracts pinnately divided; corolla violet or lavender, 1½ to 2 times as long as the calyx, its lobes bilabiately arranged, usually with 3 lobes in upper lip, and 2 lobes spreading right and left as a lower lip; stamens unequal, exserted from corolla-throat, the filaments inserted at base of throat; capsule about 6 to 9-seeded.

Sandy flats and mesas, 300 to 5000 feet: Inyo Co.; eastern and central Mohave Desert; valleys and mountains on the west borders of the Colorado Desert. East to Nevada and Arizona, south to Lower California. June.

Note on bilabiation.—The corolla in Hugelia eremica is thought to be generally bilabiate, but not constantly of one form. While there are usually 3 lobes in the upper lip and 2 in the lower one, sometimes 4 lobes go to form the upper lip and only 1 the lower. The cleft between the lobes of the lower lip is usually deeper than the clefts in the upper lip or between the upper lip and lower lip. At Cima, in the eastern Mohave Desert, this species is frequent on the Ivanpah Valley floor. The plants at that locality exhibit chiefly two marked corolla patterns: (1) upper lip of corolla with 4 lobes, the 2 uppermost lobes of the 4 forming a pair and marked alike with a purple pattern, the 2 lateral lobes of the 4 forming a pair with a common color pattern, while the lower lip, consisting of a single lobe, is destitute of a color pattern; (2) sometimes the single lobe of the lower lip "captures" a lateral lobe of the upper lip, in which case the corolla consists of an upper lip of 3 lobes all marked alike and a lower lip with 2 lobes colored or marked alike. On the sandy plain about Essex, on the southeast side of the Providence Mts., where this species is abundant, the corolla appears to be uniformly with 3 lobes in the upper lip and 2 in the lower, and without color patterns. Sometimes, apparently, there are colonies in which the corolla is subregular or only obscurely bilabiate.

Locs.—Inyo Co.: Crag Cañon, Grapevine Mts., *Gilman* 3268; Darwin Mesa, *Otto Renner* 8; Panamint Valley, *Parish* 10,162; Coso Hot Sprs., Coso Mts., *C. N. Smith* 148. Mohave Desert: Essex, *Jepson* 18,160; Mitchell Caverns, Providence Mts., *Mary Beal* 520; Cima, Ivanpah Valley, *Jepson* 15,838; betw. Halloran Sprs. and Windmill road sta., *Jepson* 15,809; Ord Mt., *Jepson* 5929; Calico Wash, Calico Mts., *Jepson* 5414; Barstow, *Jepson* 5368; Amargo, *Jepson* 15,773; Rabbit Sprs., *Parish*. Colorado Desert and west-bordering ranges: Whitewater bridge, San Gorgonio Pass, *Jepson* 12,643; Palm Springs (of Mt. San Jacinto), *Jepson* 8915; Vandeventer Flat, Santa Rosa Mts., *Jepson* 1418; Borrego Valley, *C. V. Meyer* 395; Wagon Wash near Sentenac Cañon, *Jepson* 12,495; San Felipe Narrows, e. San Diego Co., *Jepson* 12,533.

Refs.—HUGELIA EREMICA Jepson, Man. 793 (1925), type loc. Calico Wash, ne. of Barstow, *Jepson* 5414. *Navarretia densifolia* var. *jacumbana* Brand, Ann. Conserv. et Jard. Bot. Genève, 15–16:340 (1913), type loc. Jacumba, San Diego Co., *Abrams* 3640.

4. **H. lutea** Benth. Stem erect, nearly simple or branched from the base, 2 to 7 inches high; herbage arachnoid-tomentose or glabrate, the heads woolly; leaves linear, entire or with 1 or 2 short lobes at base, ½ to 1¼ inches long; heads tending to be racemose or capitately disposed; corolla bright yellow, salverform, 4 to 5 lines long, its lobes narrow-ovate, nearly as long as the tube; ovary-cells 1 or 2-ovuled.

Hillslopes, 500 to 3000 feet: Monterey Co. and southward to the Santa Ana Mts., Orange Co., in valleys or cañons just behind the outer coastal ranges. May-June.

Locs.—San Miguelito rancho near Jolon, Monterey Co., *Jepson* 1629; betw. Nacimiento River and Gorda, Monterey Co., *K. Brandegee;* Santa Lucia Mts., n. of San Luis Obispo, *Lemmon;* Highland School, nw. of Pozo, San Luis Obispo Co., *Hendrix;* Ravenna, Los Angeles Co., *K. Brandegee;* Santiago Peak, Santa Ana Mts., *Munz* 7103.

Refs.—HUGELIA LUTEA Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas;* Jepson, Man. 792 (1925). *Navarretia lutea* Brand; Engler, Pflzr. 4^{250}:168 (1907). ***Gilia lutescens*** Steud.; Benth. in DC., Prodr. 9:311 (1845); not Gilia lutea Steud. (1840).

5. **H. virgata** Benth. MONTEREY GILIA. Stem mostly erectly branched from the base or sometimes simple and erect, 5 to 15 inches high; herbage more or less tomentose when young but soon glabrate or nearly so; leaves filiform, entire or the uppermost with a pair of short lobes at base, ½ to 1¾ inches long; flowers in rather large (9 to 11 lines long) broadly turbinate heads, the heads 6 to 8-flowered, terminal or borne along the stem or branches in the leaf-axils and either subsessile or on short or long branchlets; body of the heads 5 to 12 lines broad, conspicuously surpassed by all or some of the lobes of the palmately 3 to 5-divided bracts; bracts and calyces densely woolly; calyx-lobes markedly membranous-margined (as also in all the vars.); corolla tubular-funnelform, blue (the throat yellow), 7 to 9 lines long, the throat scarcely exceeding the subulate calyx-lobes; corolla-lobes ¾ to as long as the corolla-tube and -throat; stamens about equal, exserted from the corolla-throat, the filaments inserted at base of throat; anthers 1 line long.

Sand dunes or sandy flats, 5 to 90 feet: shores of Monterey Bay. May-June. The corolla-lobes are sometimes irregularly disposed.

Locs.—Pajaro Hills, *Chandler* 454; Seaside sta., *Heller* 6753; near Monterey, *Brewer* 642.

Var. **dasyantha** (Brand) Jepson. Stems one or several from the base, simple and erect or much branched and diffuse, 5 to 14 inches high, the heads borne along the axes on short branchlets and thus racemosely or virgately disposed, or the branches much elongated, repeatedly branched and thus corymbose; leaves filiform, all entire or the uppermost with 1 (or 2) pair of teeth or short lobes near the base; heads small (5 to 6 lines long) and mostly rather narrow (the body

2 to 3 lines wide), 2 to 5-flowered (or a few 1-flowered), the bracts mostly palmately divided, exceeding the body of the heads; corolla 5 to 6 lines long, its tube glabrous inside, slightly or not at all exceeding the calyx; stamens inserted at base of corolla-throat.—Dry valley floors and low cañons, 50 to 2000 feet: Monterey Co.; cismontane Southern California from Ventura Co. to San Diego Co. June.

Locs.—South Coast Ranges: Carmel Valley, nw. Monterey Co., *M. & E. Ferguson* 254; Cholame Valley, se. Monterey Co., *Lemmon.* Cismontane S. Cal.: Santa Susanna Pass, Ventura Co., *F. Grinnell;* Decker Cañon, Santa Monica Mts., *H. & M. Dearing* 1954; Pasadena, *J. Grinnell;* Santa Ana Cañon, Orange Co., *J. T. Howell* 2471; San Bernardino Valley (e. end), *Jepson* 5561; Riverside, *Jepson* 1231; San Gorgonio Pass, *Jepson* 6072; San Jacinto Valley, *Geo. F. Reinhardt;* Temescal Wash, nw. of Elsinore, *Jepson* 1574; Temecula, sw. Riverside Co., *C. V. Meyer* 152; Pala, San Diego Co., *Peirson* in litt.

Var. **sapphirina** (Eastw.) Jepson. Openly branched, 4 to 10 inches (or 2 feet) high; leaves entire; heads few (1 to 4)-flowered, weakly lanate; peduncles and sometimes the bracts minutely glandular; bracts usually with membranous intervals in the sinuses.—Chaparral slopes and sandy flats, 1900 to 7400 feet, cismontane Southern California: San Gabriel Mts. (Rubio Cañon, *Peirson* 156; Swartout Cañon, *Hall* 299); San Bernardino Mts. (Bear Valley, *Clokey* 5284); San Jacinto Mts. (Strawberry Valley, *Hall* 329; Hemet Valley, *C. M. Wilder* 959); San Diego Co. (Palomar Mt., *Esther Hewlett* 48; Cuyamaca Mts., *Dunn;* Witch Creek, *Alderson;* Buckman Sprs., *C. V. Meyer* 434). South to Lower California. The corolla has a livelier and brighter blue than any other form in the Hugelia virgata group (F. W. Peirson).

Var. **ambigua** (Jones) Jepson comb. n. Erect branching plant, or diffusely branched, 4 to 7 inches high; herbage less woolly than in species, soon glabrate, the peduncles usually finely glandular; leaves entire or sometimes with a pair of short lobes at base; bracts short, thickish, usually not exceeding the heads; heads small (1½ to 3 or 6 lines wide); corolla-tube about equaling the calyx.—Sandy mesas or gravelly slopes, 2500 to 6000 feet, western Mohave Desert and its bordering mountain slopes: Lancaster, *K. Brandegee;* Palmdale, *Elmer* 3666; Arrastre Creek, n. slope San Gabriel Mts., *Peirson* 922; Swartout Valley, San Antonio Mts., *Munz* 7724; Hesperia, *Wilson* 32; Cushenbury Sprs., n. slope San Bernardino Mts., *Yates;* Walker Pass, s. Sierra Nevada, *Purpus* 5391.

Refs.—HUGELIA VIRGATA Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas;* Hook., Icon. Pl. t. 200 (1837), an excellent illustration; Jepson, Man. 792 (1925). *Gilia virgata* Steud., Nom. Bot. ed. 2, 1:684 (1840). *Navarretia virgata* Brand; Engler, Pflzr. 4^{250}:167 (1907). *N. densifolia* var. *lanata* Brand, l.c. 165, type loc. Seaside sta., Monterey Co., *Heller* 6753. Var. DASYANTHA Jepson, Man. 793 (1925). *Navarretia virgata* subsp. *gymnocephala* var. *dasyantha* Brand; Engler, Pflzr. 4^{250}:168 (1907), type *Hall* 298, collected in Swartout Cañon, San Antonio Mts., acc. Hall Field Book. Var. SAPPHIRINA Jepson, Man. 793 (1925). *Gilia sapphirina* Eastw., Bot. Gaz. 38:71 (1904), type loc. San Jacinto Mts., *Blanche Trask. Navarretia virgata* subsp. *gymnocephala* Brand var. *sapphirina* Brand, l.c. 168. *Gilia virgata* var. *sapphirina* Mcbr., Contrib. Gray Herb. 49:58 (1917). Var. AMBIGUA Jepson. *Gilia floccosa* var. *ambigua* Jones, Contrib. W. Bot. 13:2 (1910), type loc. Victorville, Mohave Desert, *Jones* 10,011. *G. virgata* var. *ambigua* Craig, Bull. Torr. Club 61:412 (1934). *H. virgata* var. *pygmaea* Jepson, Man. 793 (1925), type loc. New York Mts., e. Mohave Desert, *Jepson* 5463, perhaps belongs here (typ. in Herbario Jepsoniano).

6. **H. filifolia** (Nutt.) Jepson. Stem erect, virgately branched or with ascending branches, or sometimes simple, 2 to 12 inches high; herbage white-tomentulose or glabrate; leaves filiform, all entire or a few with 2 small lobes at base, ¼ to 1¼ inches long; heads oblong to narrow-ovate, mostly 2 to 3 (or 4) lines broad, densely woolly, 1 to 3-flowered; bracts linear, woolly or glabrate, straight or ascending-recurved, all with 1 or rarely 2 pairs of short lobes at base; calyx densely woolly, its lobes shorter than the tube; corolla blue or white, 3½ to 4½ lines long, mostly 1¼ to 1½ times as long as the calyx, its tube nearly equaling or a little exceeding the calyx; stamens inserted at middle or base of corolla-throat, the anthers barely exserted from corolla-throat; ovary cells 4-ovuled.

Dry sandy places: on the coast line in coastal Southern California, 20 to 1900 feet; intramontane Southern California, 5900 to 6100 feet; Sierra Nevada, 4000 to 6800 feet, mostly east side or easterly summits or valleys from Kern Co. to Lassen Co.; North Coast Ranges, 2500 to 2700 feet, from Lake Co. to Trinity Co. South to Lower California, east to western Nevada, north to Oregon and Idaho. June-Aug.

Locs.—Coastal S. Cal., on the coast line: San Diego, *M. F. Spencer* 66; Howard Cañon, La Jolla, *Clements* 81; Cochies Prietos, Santa Cruz Isl., *Hoffmann.* Intramontane S. Cal.: Cactus Flat, San Bernardino Mts., *Munz* 10,500; Mt. Piños, n. Ventura Co., *Dudley & Lamb* 4685. Sierra Nevada (east side or easterly summits or flats mostly): Poso Creek, Greenhorn Mts., *C. N. Smith*

197; Bubbs Creek, Kings River Cañon (Sierra Club Publ. 27:70); Mono Mdw., South Fork San Joaquin River, *A. L. Grant* 1490; Fales Hot Sprs., Mono Co., *Ottley* 1027; Lakeside Park, Lake Tahoe, *Geis* 107; Sierra Valley, e. Sierra Co., *Lemmon;* Beckwith Pass, Lassen Co., *Jepson* 7757; Eagle Lake, *Baker & Nutting.* North Coast Ranges: betw. Burns Valley and Borax Lake, Lake Co., *Hoover* 3553; Hyampum, Trinity Co., *Chesnut & Drew;* Hay Fork Valley, Trinity Co., *Tracy* 6463. Western Nevada on the easterly slope of, or in areas bordering, the eastern Sierra Nevada: betw. Washoe and Franktown, *Heller* 10,603a; Eagle Valley, Ormsby Co., *C. F. Baker* 1403.

Var. **floccosa** (Gray) Jepson comb. n. Stem erect, paniculately branched, sometimes diffuse, sometimes subsimple, 4 to 11 inches high; herbage floccose-tomentose, more or less glabrate; leaves narrowly linear, ½ to 1 inch long, with 1 (or 2) pairs of linear lobes at or near the base; bracts palmately 3 or 5-cleft, the middle lobe elongated; heads persistently woolly, mostly 2 to 6-flowered, the body ovate or subglobose, (2 or) 4 to 7 lines broad; calyx equaling or a little exceeding corolla-tube; corolla blue or white or pale lilac, 4 to 7 lines long, the throat yellowish with maroon markings; corolla-tube and -throat 1½ to 2¼ times as long as the calyx, sometimes barely exceeding the calyx; stamens inserted about middle of corolla-throat or a little below, the anthers exserted from throat.—Dry flats or sandy hills, 2000 to 5000 feet: east side or easterly valleys of the Sierra Nevada from Inyo Co. to Lassen Co.; inner South Coast Range in Fresno and San Luis Obispo Cos.; inner North Coast Range in Lake Co. East to Utah and north to Idaho and eastern Washington. June-Aug.

Tax. note.—The name Hugelia filifolia var. floccosa (Gray) Jepson rests on Gilia floccosa Gray. Since the name used by this author is only of varietal rank, it is not necessary under the International Rules to establish valid publication for the name Gilia floccosa Gray as applied to the Great Basin plant, but it is of scientific interest to do so. In publishing Gilia floccosa it is clear that Gray did not base his proposed species on "Hugelia floccosa Nutt. in herb.," which was a nomen nudum and cited merely as a possible synonym, and as a possible synonym only because it was to Gray an uncertainty. Gray's description of his species and indication of its geographic range applies mainly if not wholly to transmontane plants. Moreover, a new name with a properly published description cannot be invalidated because of wrongly citing the name of a different and valid species as a synonym. In this case Gray's name cannot be invalidated by the name Hugelia lutea Benth., which belongs to a different species of the California coast line. Moreover, although Hugelia lutea was cited by Gray as a synonym, it is so cited with slightly qualifying phrases which indicate shadows of doubt. Yet again, further light on Gray's main intent may be had from subsequent works written at the Gray Herbarium, namely: Botany of the King Expedition (267,—1871, in which application of the name, Gilia floccosa, is limited wholly to Great Basin plants); Botany of the California Geological Survey (1:495,—1876, in which the name is applied primarily to transmontane plants); Synoptical Flora (2:143,—1878, in which the name refers solely to Great Basin or interior plants, the name Hugelia lutea Benth. being definitely excluded). All these works, thus, make Gilia floccosa Gray a Great Basin plant. Gilia floccosa Gray, a transmontane plant, was sufficiently published. One cannot disqualify this name by reason of Hugelia floccosa Nutt., which had never been published and which was cited only with uncertainty as a nomen nudum; nor by reason of the name Hugelia lutea Benth., which belongs rightly to another species. Since, therefore, the name Gilia floccosa Gray is applicable only to the interior plant and not to a coastal plant, the following later names of the interior plant are added to the synonymy: Gilia wilcoxii Nels., Navarretia wilcoxii Brand and Welwitschia wilcoxii Rydb.

Field note.—The range of variation in plant habit in Hugelia filifolia var. floccosa is rather marked. Slender tall forms and coarse stocky forms, otherwise identical, may be found in the same collection. Densely branched forms are very unlike, in appearance, slender erect few-branched forms. Heads in different collections vary in size, the forms with large crowded several-flowered heads differing noticeably from forms with narrow few-flowered heads, these latter simulating closely the aspect of typical Hugelia filifolia.

Locs.—East side of the Sierra Nevada: Darwin Mesa, *Otto Renner* 80; Owens Valley, *Horn* 2850; Bishop, Inyo Co., *Almeda Nordyke;* Black Cañon, White Mts., *Duran* 2681; Mono Craters, *Peirson* 10,755; Freshwater Spr., near Mono Lake, *Ottley* 1100; Bloody Cañon, *Chesnut & Drew;* Dog Valley, e. Nevada Co., *Jepson* 15,049; Long Valley, Lassen Co., *Jepson* 7792. Inner South Coast Ranges in western Fresno Co. and in San Luis Obispo Co.: Waltham Creek, Diablo Range, *Eastwood & Howell* 5835; Black Mt., Pozo Range, *Gifford;* (these last two collections match very closely *Duran* 2681 from the White Mts. east of the Sierra Nevada, cited above). Inner North Coast Range: Snow Mt., Lake Co., *K. Brandegee.*

Refs.—HUGELIA FILIFOLIA Jepson, Man. 792 (1925). *Gilia filifolia* Nutt., Proc. Acad. Phila. 4:11 (1848), type loc. near Santa Barbara, *Gambel. Navarretia filifolia* Brand; Engler, Pflzr. 4^{250}:167 (1907). *Eriastrum filifolium* Woot. & Sta., Contrib. U. S. Nat. Herb. 16:160 (1913). *Welwitschia filifolia* Rydb., Fl. Rocky Mts. 688 (1917). *Gilia virgata* var. *filifolia* Mlkn., Univ. Cal. Publ. Bot. 2:39 (1904). *G. floccosa* var. *filifolia* Nels. & Mcbr., Bot. Gaz. 61:35 (1916). *G. sparsiflora* Eastw., Proc. Cal. Acad. ser. 3, 2:291 (1902), type loc. Kings River Cañon, *Eastwood. Navarretia filifolia* subsp. *sparsiflora* Brand; Engler Pflzr. 4^{250}:167 (1907). *Gilia filifolia* var. *sparsiflora* Mcbr., Contrib. Gray Herb. n. s. 49:57 (1917). *H. filifolia* var. *sparsiflora* Jepson, Man. 792 (1925). Var. FLOCCOSA Jepson. *Gilia floccosa* Gray, Proc. Am. Acad. 8:272 (1870), "California to Arizona, interior of Oregon, and Utah"; of the various collections before Gray when he described this plant, the following is here named as lectotype: Truckee Desert, w. Nev., *W. W. Bailey* 914 (Gray Herb.). *Hugelia floccosa* Howell, Fl. Nw. Am. 458 (1901). *G. virgata* var. *floccosa* Mlkn., Univ. Cal. Publ. Bot. 2:40 (1904). *Navarretia virgata* subsp. *floccosa* Brand; Engler, Pflzr. 4^{250}:168 (1907). *Welwitschia floccosa* Rydb., Fl. Rocky Mts. 688 (1917). *Gilia wilcoxii* Nels., Bot. Gaz. 34:27 (1902), type loc. St. Anthony, Ida., *Wilcox & Merrill* 822. *Navarretia wilcoxii* Brand; Engler, Pflzr. 4^{250}:165 (1907). *Welwitschia wilcoxii* Rydb., Fl. Rocky Mts., 688 (1917).

7. **H. diffusa** (Gray) Jepson comb. n. Stem diffusely and usually divaricately branched, 3 to 6 inches high; branches reddish-brown, glabrate, the flower heads densely woolly with mostly glabrate bracts; leaves 2 to 7 lines long, entire or with 1 or 2 pairs of short lobes near the base, glabrate; flower heads many, 2 to 6 lines broad, not exceeded by the bracts or rarely markedly exceeded; bracts palmately 3 to 5-lobed; corolla pale blue or white with yellow throat; stamens included in corolla-throat.

Sandy flats, 300 to 2500 feet: Mohave and Colorado deserts. East to Nevada and Texas. Apr.-June.

Locs.—Mohave Desert: Lancaster, *K. Brandegee; * Copper City (ridges n.), *C. N. Smith;* Kessler Peak, Ivanpah Mts., *Jepson* 15,827; Cima, Ivanpah Valley, *Jepson* 15,849; Needles, *Jones* 5148. Colorado Desert: McCoy Wash, e. Riverside Co., *Hall* 5965; Coachella, *Schellenger* (not typical); San Felipe, e. San Diego Co., *K. Brandegee;* Vallecito, e. San Diego Co., *Jepson* 8590.

Var. **harwoodii** (Craig) Jepson comb. n. Heads markedly white-tomentose; corolla-lobes apiculate.—Eastern Mohave Desert (Kelso) and eastern Riverside Co. (Bull. Torr. Club 64:425).

Refs.—HUGELIA DIFFUSA Jepson. *Gilia filifolia* var. *diffusa* Gray, Proc. Am. Acad. 8:272 (1870), "Fort Mohave and Nevada to New Mexico and the borders of Texas." *Navarretia filifolia* var. *diffusa* Brand; Engler, Pflzr. 4^{250}:167 (1907). *Welwitschia diffusa* Rydb., Fl. Rocky Mts. 688 (1917). Var. HARWOODII Jepson. *Gilia filifolia* var. *harwoodii* Craig, Bull. Torr. Club, 64:424 (1934), type loc. Blythe jct., e. Riverside Co., *Munz & Harwood* 3589.

8. **H. hooveri** Jepson sp. n. Stem simple or sparingly branched, 2 to 4 inches high; leaves linear-filiform, entire, 6 to 7 lines long; flowers 1 to 3 in clusters terminal on the branchlets; bracts 2 to 2½ times as long as the flowers, tomentose below or glabrate, linear and entire, or with 1 or 2 pairs of lanceolate lobes at the middle or below, the lobes more or less recurved; calyx tomentose; corolla pure white, equaling or slightly exceeding the calyx, 2½ to 4 lines long, its lobes equal, bilabiately arranged or regular; stamens included in corolla-throat; capsule ovoid, 1½ lines long, each cell containing 2 to 4 seeds.—(Caulis simplex vel pauciramosus, 2–4 unc. altus; folia lineari-filiformia, 6–7 lin. longa; flores 1–3-aggregati terminalesque; bracteae lineares integerrimae, vel loborum lanceolatorum 1–2-jugis medialibus vel infernis praeditae; calyces tomentosi; corolla candida, bilabiata vel regularis, calycem aequans vel pauce superans, 2½–4 lin. longa).

Clay plains, 200 to 450 feet: floor of the San Joaquin Valley from Fresno Co. to Kern Co. Apr.

Locs.—Kerman (9 mi. s.), Fresno Co., *Hoover* 1780; betw. Lost Hills and Semitropic, Kern Co., *Hoover* 1801; Oildale, Kern Co., *Hoover* 4081.

Ref.—HUGELIA HOOVERI Jepson; type loc. Shafter, Kern Co., *Hoover* 1846 (typ. in Herbario Jepsoniano).

9. **H. abramsii** (Elmer) Jepson & Bailey comb. n. Stem freely and erectly branching from and above the base or sometimes reduced and subsimple, 2 to 5½ inches high; herbage lanate, soon glabrate, the heads persistently white-woolly; leaves ¾ to 1½ inches long, pinnately divided with 2 pairs or 1 pair of filiform segments, or rarely a few leaves entire and filiform; body of the bracts white-woolly, the 3 linear or subulate divisions spreading or divaricate, mostly glabrate; heads 6 to 10-flowered, terminal on the branches, about 5 to 7 lines broad; calyx with lanceolate-subulate lobes ½ as long as the very scarious tube, white-woolly except the tips of the lobes; corolla white, 2½ lines long, its tube narrowly tubular (scarcely or not at all enlarged upward into a throat), its lobes narrow, about ⅖ to ½ as long as the tube; capsule 3-seeded, the seeds narrowly oblong, mucilaginous under water.

Sandy flats in the valleys or gravelly slopes in the hills, 1400 to 2000 feet: Lake Co.; Santa Cruz Mts. June.

Geog. note.—Hugelia abramsii is an endemic of the central Coast Range region limited to two narrow areas, one in Lake Co. and the other in the Santa Cruz Mts. The plant in the field has a distinctive aspect in the intense green of its narrowly divided bracts which contrast curiously with the white matted wool of the heads. The known stations are as follows.—Lake Co.: Coldstream, *Curran;* betw. Burns Valley and Borax Lake, *Hoover* 3554; Mt. Konocti, *Blankinship.* Santa Cruz Mts.: Emerald Lake, San Mateo Co., *L. S. Rose;* Black Mt., Santa Clara Co., *Pendleton* 137.

The long and narrow capsules of this species have been noted by Virginia L. Bailey. This feature is similar to the capsules in Hugelia virgata. No species of Navarretia with 3-celled capsules possesses capsules that are so narrow and so long. The character of the woolly heads is rather that of Hugelia than of Navarretia, where this species has formerly rested. Its seed-coats are also mucilaginous under water as in other Hugelia species.

Refs.—HUGELIA ABRAMSII Jepson & Bailey. *Navarretia abramsii* Elmer, Bot. Gaz. 41:314 (1906), type loc. Black Mt., Santa Clara Co., *Elmer* 4586; Jepson, Man. 788 (1925).

6. **COLLOMIA** Nutt.

Herbs with alternate leaves. Flowers in ours in dense clusters with foliaceous bracts. Calyx turbinate, in age obpyramidal or cup-shaped, its teeth or lobes equal, entire, erect, the sinuses in age distended at base into an outwardly-projecting fold. Corolla narrowly funnelform or salverform, salmon-yellow, reddish, purple, blue or white. Stamens usually unequal, unequally or equally inserted on the corolla-throat, mostly straight. Seeds 1 in each cell (sometimes 2 or 3), the seed-coat often developing spiral threads when wet. Capsule oval to obovoid.—Species about 18, western North America and Chile. (Greek kolla, glue, on account of the mucilaginous seeds.)

Bibliog.—Kellogg, A., Description of two new species of Collomia from Nevada Territory (Proc. Cal. Acad. 3:17,—1863). Payson, E. B., Collomia debilis and its relatives (Univ. Wyo. Publ. Bot. 1:79–87,—1924).

- Annuals; seeds becoming mucilaginous when wetted; widely distributed.
  - Leaves variously lobed, toothed or pinnately parted, petioled; capsule-valves campanulately recurved at apex on dehiscence..........1. *C. heterophylla.*
  - Leaves entire; capsule-valves curved backward from each side on dehiscence.
    - Stem diffusely branched; stamens equally or nearly equally inserted in the corolla-throat but of unequal length; calyx-teeth awn-pointed; leaf-blades subsessile or with a margined petiole..........2. *C. tinctoria.*
    - Stem simple; stamens unequally inserted in the corolla-throat; calyx-teeth acute, acuminate or obtusish; leaf-blades sessile.
      - Corolla 4 to 9 lines long, purple or pink, the limb 1 to 3 lines broad; calyx-lobes lanceolate-acuminate or subulate..........3. *C. linearis.*
      - Corolla 10 to 12 lines long, pale orange, the limb 3 to 6 lines broad; calyx-lobes triangular-acute or ovate-acute..........4. *C. grandiflora.*
- Perennials; seeds not becoming mucilaginous when wetted.
  - Plants tall (1 to 2 feet high), erect; corolla orange, 1 to 1¼ inches long; Madera Co..........5. *C. rawsoniana.*
  - Plants low or depressed (1 to 6 inches high); corolla blue, 7 to 8 lines long; Lassen Peak..........6. *C. larsenii.*

1. **C. heterophylla** Hook. Stem diffusely branching from the base, the branches 3 to 11 (or 20) inches long; herbage villous and puberulent and usually more or less glandular; blades of lower leaves ½ to 1 inch long, pinnately cleft or pinnately divided, the segments toothed or laciniately cleft, varying greatly in shape and size (1 to 7 lines long), the petioles ½ to as long as the blade; blades of upper leaves, or sometimes all, ovate or oblong, incised, few-toothed or even entire, 5 to 11 lines long, petioled; flowers in small bracted clusters at the ends of the branches; calyx ½ as long as corolla, its chartaceous tube with scarious intervals to the base, its lanceolate lobes green-herbaceous, as long or a little longer than the tube; calyx-tube in fruit turbinate; corolla red-purple or pink, tubular-funnelform, 4 to 6 lines long, the lobes ½ to 1 line long; stamens with extremely short filaments, very unequally

inserted in the throat, the anther of the uppermost stamen sometimes protruding from the throat; capsule ellipsoid, seeds 2 or 3 in each cell.

Shady places in the foothills, 200 to 2600 feet: San Bernardino foothills; Sierra Nevada from Kern Co. to Shasta Co.; Coast Ranges (mostly in the outer and middle ranges) from Monterey Co. to western Siskiyou Co. and Del Norte Co. North to British Columbia and Idaho. Mar.-Apr.

Locs.—San Bernardino Mts.: foothills, s. slope (Pl. World 20:249). Sierra Nevada: Kernville, *T. Brandegee;* East Fork Kaweah River, *Jepson* 1006a; Italian Bar, Tuolumne Co., *A. L. Grant* 27a; Sutter Creek, Amador Co., *Braunton* 1066; Forest Hill, Placer Co., *L. S. Smith* 1622; Brush Creek, Butte Co., *Conger;* Upper Soda Sprs., near Dunsmuir, *Heller* 7947. Coast Ranges: Point Sur, Monterey coast, *T. Brandegee;* Gilroy, *Jepson* 14,992; Stanford, *C. F. Baker* 869; Mt. Tamalpais, *Newlon* 86; Blue Lakes, Lake Co., *Jepson* 14,991; Fort Bragg, *Mathews* 57; Look Prairie, Bull Creek, Humboldt Co., *Constance* 628; Kneeland Prairie, Humboldt Co., *Tracy* 3044; Shackleford Creek, w. Siskiyou Co., *Butler* 1496; Eighteen-mile Creek, Del Norte Co., *R. Van Deventer* 93; Gasquet, Del Norte Co., *Tracy* 12,378.

Refs.—COLLOMIA HETEROPHYLLA Hook., Bot. Mag. t. 2895 (1829), type from Cal., *Menzies;* Jepson, Fl. W. Mid. Cal. 424 (1901), ed. 2, 329 (1911), Man. 784 (1925). *Gilia heterophylla* Dougl.; Hook. l.c.; Lindl., Bot. Reg. t. 1347 (1830). *C. diversifolia* Greene, Pitt. 1:128 (1887), type loc. Epperson road, mts. of sw. Colusa Co. [probably above present Venado road sta.], *Curran.*

2. **C. tinctoria** Kell. Stem diffusely branched (or simple when much reduced), 2 to 6 (or 8) inches high; herbage glandular-villous; leaves linear or lanceolate, entire, ½ to 2 inches long, subsessile or gradually narrowed to a margined petiole; flowers in capitate clusters at the ends of the branches or solitary or in 2s or 3s in the leaf-axils; calyx turbinate, its tube chartaceous with scarious intervals to base beneath the sinuses, the teeth conspicuously awn-pointed from a broad base, 1¼ to 2 lines long; corolla yellow, slender-funnelform, the tube almost filiform, often purple, 4½ to 11 lines long, 2 to 3 times as long as the calyx; stamens equally or nearly equally inserted above middle of corolla-throat; filaments unequal, the longer exserted; style equaling the corolla-tube; cells of the capsule one-seeded.

Montane, 1000 to 6500 (or 8000) feet: North Coast Ranges from Lake Co. to western Siskiyou Co.; Sierra Nevada from Mono Co. to Shasta and Modoc Cos. North to eastern Oregon and Idaho. June-July.

Locs.—North Coast Ranges: Snow Mt., n. Lake Co., *T. Brandegee;* South Yollo Bolly, *Jepson* 14,994; South Fork Mt., Humboldt Co., *Tracy* 9046; Dinsmore, Van Duzen River Valley, *Tracy* 16,372; Trinity Summit, n. Humboldt Co., *Tracy* 10,468; Mary Blaine Mt., Trinity Co., *Tracy* 14,466; betw. Orleans Bar and Somes Bar, Klamath River, *Chandler* 1475; Sisson, s. Siskiyou Co., *S. Brown;* Marble Mt., w. Siskiyou Co., *Chandler* 1634. Sierra Nevada: Sonora Pass (e. side), *A. L. Grant;* French Mdws., Middle Fork American River, Placer Co., *L. S. Smith* 1680a; Dog Valley, e. Nevada Co., *Jepson* 21,223; Truckee, *Sonne* 388; Mineral, e. Tehama Co., *J. Grinnell;* Pine Creek, Lassen Co., *Baker & Nutting;* Thousand Lake Valley, s. of Mt. Burney, e. Shasta Co., *Peirson* 10,200; Forestdale, sw. Modoc Co., *M. S. Baker.*

Refs.—COLLOMIA TINCTORIA Kell., Proc. Cal. Acad. 3:17, fig. 2 (1863), type from "western slope of the Sierra Nevada Mts.," *H. C. Dorr;* Jepson, Man. 784 (1925). *C. linearis* var. *subulata* Gray, Proc. Am. Acad. 8:259 (1870), based on C. tinctoria Kell. *Gilia tinctoria* Kell.; Curran, Bull. Cal. Acad. 1^3:142 (1885). *G. aristella* Gray, Syn. Fl. ed. 2, 408 (1886), type loc. "northern part of California," *Greene* (that is, Siskiyou Co.). *C. aristella* Rydb., Mem. N. Y. Bot. Gard. 1:318 (1900). *C. tinctoria* var. *subulata* Brand; Engler, Pflzr. 4^{250}:52 (1907).

COLLOMIA TENELLA Gray, Proc. Am. Acad. 8:259 (1870), type loc. Parleys Park, Wasatch Mts., Utah, *Watson.* Similar to C. tinctoria; stem branching freely, 2 to 7 inches high, the branches slender; flowers 2½ to 3 lines long; calyx-teeth triangular-acute, ½ to 1 line long; corolla white or lavender, twice as long as the calyx.—Great Basin region, 1000 to 3000 feet, from Nevada, Utah and Wyoming to eastern Washington. June. It has been attributed to California: Yosemite, mts. s. of (Bot. Cal. 1:488); Siskiyou Mts. (Engler, Pflzr. 4^{250}:51).

3. **C. linearis** Nutt. Stem usually simple and erect, 4 to 11 (or 23) inches high; herbage puberulent, mostly non-glandular or often glandular above, the calyx more or less glandular-puberulent; leaf-blades linear to linear-lanceolate, entire, sessile, ½ to 2¼ inches long; flowers in a terminal capitate cluster or some in 1 to few-flowered clusters on short lateral branchlets; calyx-tube narrow-turbinate in anthesis with scarious intervals to base beneath sinuses, in fruit turbinate, the tube

chartaceous and only the slender or acuminate part of the calyx-lobes green-herbaceous; calyx-lobes about as long as the tube; corolla red-purple or pink, slender-funnelform, 4 to 5 or 9 lines long, 1½ to 2 times as long as the calyx; stamens short, very unequally inserted in corolla-throat about the middle, included; style included; cells of the capsule 1-seeded.

Dry flats and slopes in the mountains, 4500 to 8500 (less commonly 2900 to 11,000) feet: San Bernardino Mts.; Sierra Nevada, west slope, from Tulare Co. to Butte Co.; east side of the Sierra Nevada from Inyo Co. to east borders of Modoc Co. East to Colorado, Nebraska and Minnesota, north to Manitoba and Alaska. May-Aug.

Geog. note.—Although Collomia linearis inhabits stations on the west slope of the Sierra Nevada, the general weight of its distribution in California is transmontane and leans eastward and northeastward towards the ranges bordering the Great Basin. The one station in the San Bernardino Mountains is to a considerable degree transmontane, ecologically considered, while in the Sierra Nevada the known stations are chiefly on the easterly summits and plateaus and on the easterly slopes. It does not occur in the North Coast Ranges (the citation of Humboldt Co. in Man. Fl. Plants Cal., 784, being an error), nor is it known from Siskiyou Co.

Locs.—San Bernardino Mts.: Bear Valley (Pl. World, 20:249). West slope of the Sierra Nevada: Telephone Ridge, s. Tulare Co., *C. N. Smith* 24; Volcano Creek, Tulare Co., *Jepson* 4937; Quail Mdw., Mono Creek, Fresno Co., *Jepson* 13,210; Mariposa Grove, *Bolander* 5000; Cow Creek, Tuolumne Co., *A. L. Grant* 76; Bear Valley, Amador Co., *Hansen;* Summit sta., Nevada Co., *Jepson* 21,102; Blairsden, Plumas Co., *Ewan* 8242; Jonesville, Butte Co., *E. B. Copeland* 678. East side of the Sierra Nevada: Bishop Creek, Inyo Co., *Almeda Nordyke;* White Mts., Mono Co., *Shockley* 475; Leevining Creek, w. Mono Co., *Ottley* 1096; Donner Lake, *Sonne;* Sierra Valley, *Lemmon;* Mill Creek, Warner Mts., *L. S. Smith* 1000; Suprise Valley, e. Modoc Co., *Jepson* 7842.

Refs.—COLLOMIA LINEARIS Nutt., Gen. 1:126 (1818), type from "near the banks of the Missouri [River], about the confluence of Shian River, and in the vicinity of the Arikaree village," *Nuttall;* Lindl., Bot. Reg. t. 1166 (1828); Jepson, Man. 784 (1925). *Gilia linearis* Gray, Proc. Am. Acad. 17:223 (1882). *C. linearis* var. *humilis* Brand; Engler, Pflzr. 4^{250}:49 (1907), type loc. "Soda Sprs." (that is, Soda Sprs. sta., Nevada Co.), *Jones* 2570.

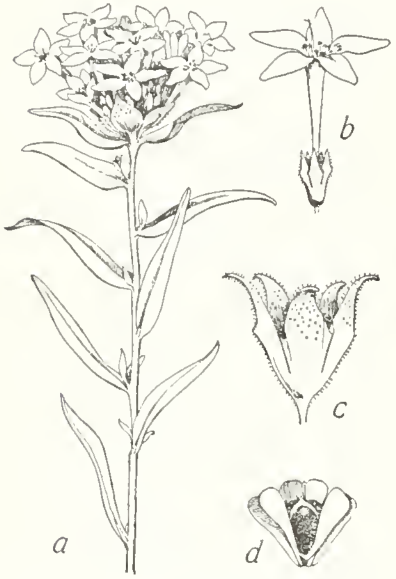

Fig. 378. COLLOMIA GRANDIFLORA Dougl. *a*, top of fl. stem, × ½; *b*, fl., × 1; *c*, fruiting calyx, × 2; *d*, capsule, × 2.

4. **C. grandiflora** Dougl. (Fig. 378.) Stem erect, simple (or rarely branched), ⅔ to 3 feet high; herbage glabrous to minutely puberulent, the calyces and often the bracts viscid-pubescent; leaf-blades oblong-lanceolate to linear, entire, sessile, 1 to 3 inches long; flowers crowded in terminal head-like clusters, the clusters leafy-bracted, or some flowers often borne below, either singly in the axils or in small clusters on short branchlets; calyx-tube obconical, thick chartaceous (without scarious intervals), only the broad bluntly acute lobes green; calyx-lobes in anthesis about half as long as tube; corolla pale apricot-color or salmon-color, narrowly funnelform, 10 to 12 lines long, its tube thrice as long as the calyx, its lobes broadly oblong; stamens unequally inserted on lower part of corolla-throat, the longer ones slightly exserted from throat; anthers blue; cells of the capsule 1-seeded.

Dry open slopes or dry open pine woods, (100 or) 1000 to 8000 feet, at its higher altitudes occurring nearly throughout the state: mountains of Southern California; Mt. Hamilton Range; Santa Cruz Mts.; North Coast Ranges from northern Lake Co. to western Siskiyou Co.; Tehachapi Mts.; Sierra Nevada from Tulare Co. to eastern Siskiyou Co. and Modoc Co. East to Utah and Wyoming, north to Idaho and British Columbia. May-Aug.

Locs.—S. Cal. mts.: Descanso, San Diego Co., *Munz* 7175; Palomar Mt., *Jepson* 1507; San Jacinto Mts., *Gilman* 753; San Bernardino Mts., *Parish;* Big Pine Mt., San Rafael Mts., *H. & M. Dearing* 1358; Pine Cañon, Liebre Mts., *Peirson* 3548. Mt. Hamilton Range: Mt. Hamilton, *Davy.* Santa Cruz Mts.: 4 mi. n. of Saratoga. North Coast Ranges: betw. Alder Sprs. and Macdonald road sta., nw. of Cloverdale, *Jepson* 17,664; betw. Stubbs and North Fork Cache Creek, e. of Clear Lake, *H. A. Dutton;* Snow Mt., n. Lake Co., *T. Brandegee;* South Yollo Bolly, *Jepson* 14,996; Fort Bragg, *Mathews* 94; Dyerville, South Fork Eel River, *Constance* 863; Yager Creek (head of), Humboldt Co., *M. S. Baker* 37; Hupa, n. Humboldt Co., *Chandler* 1361; Corral Prairie, Trinity Summit, *Tracy* 10,501; Cold Spr., Woolly Creek, Marble Mts., *Butler* 106; Yreka, *Butler* 796; Poker Flat, w. Siskiyou Mts., *Jepson* 18,535. Tehachapi Mts.: Bisses sta., *Dudley* 380. West slope of the Sierra Nevada: Mineral King, Tulare Co.; Bubbs Creek, South Fork Kings River, *Newlon* 224; Palisade Creek to Simpson Mdw., Middle Fork Kings River, *E. Ferguson* 523; Trimmer Sprs., Fresno Co., *H. P. Kelley;* Arnold Mdw., Fresno Co., *A. L. Grant* 1382; Yosemite, *Jepson* 10,476; Hetch-Hetchy, *Jepson* 3470; Kennedy Lake, e. Tuolumne Co., *A. L. Grant* 234; Bear Valley, Nevada Co., *Jepson* 21,106; Meadow Valley, Plumas Co., *Fritz & Harris;* Mineral, e. Tehama Co., *J. Grinnell;* Warner Mts., e. Modoc Co., *Manning* 35; Andesite sta., n. of Mt. Shasta, *Jepson* 20,025. East side of the Sierra Nevada: Bishop, Inyo Co., Cal., *Almeda Nordyke;* Kings Cañon, Ormsby Co., Nev., *C. F. Baker* 1862; Hunter Creek, Washoe Co., Nev., *Kennedy* 1622.

Refs.—COLLOMIA GRANDIFLORA Dougl.; Lindl., Bot. Reg. t. 1174 (1828), type from "the northwest of North America, in all the country bordering on the river Columbia, as far to the eastward as the valleys of the Rocky Mountains," *Douglas;* Jepson, Fl. W. Mid. Cal. 423 (1901), ed. 2, 329 (1911), Man. 784, fig. 766 (1925). *Gilia grandiflora* Gray, Proc. Am. Acad. 17:223 (1882).

5. **C. rawsoniana** Greene. LADY COLLOMIA. Stem simple or with a few short branches above, very leafy, 1 to 2 feet high, arising from a slender horizontal rootstock; leaves all cauline, the blades ovate to oblong-lanceolate, coarsely and incisely serrate or entire towards the base, rather thin, viscid-pubescent, 1 to 2½ inches long, narrowed below to a sessile base; calyx 4 to 4½ lines long, its lobes narrowly lanceolate, longer than the tube, the tube uniformly chartaceous; corolla orange, turning pinkish on drying, narrowly funnelform, 1 to 1¼ inches long, 4 times as long as the calyx, its lobes 4 to 5 lines long, its throat longer than the tube; stamens exserted, the filaments equally inserted at the base of the corolla-throat; capsule valves in dehiscence laterally reflexed; seeds not becoming mucilaginous, one in each cell.

Montane, 4000 to 7000 feet: Sierra Nevada in Madera Co. Aug.

Geog. note.—Collomia rawsoniana is an extremely narrow endemic. It was first discovered in 1888 by L. A. Rawson Peckinpah in Madera County, undoubtedly at or near Cascadel ranch, which is on the drainage of a tributary of North Fork San Joaquin River and about 3½ miles east of Northfork station. Aside from the Northfork district it is known only from Beasore Mdw., Madera Co. (*Margaret Ryan*), which is on the headwaters of Beasore Creek, a branch of Chiquito Creek which flows into the San Joaquin River. As at present known it has a longitudinal range of about fifteen miles.

Refs.—COLLOMIA RAWSONIANA Greene, Pitt. 1:221 (1888), type loc., "the higher valleys of the Sierra Nevada in Fresno Co." (the exact locality, Cascadel ranch, near Peckinpah Mill, is now in Madera Co.), *Peckinpah;* Jepson, Man. 785 (1925). *Gilia rawsoniana* Mcbr., Contrib. Gray Herb. 56:57 (1918).

6. **C. larsenii** Payson. Stem simple or branched from base, 1 to 6 inches high, arising from a slender deep-seated rootstock, the thickish leaves crowded on the stems at the surface of the ground and forming dense tufts; herbage finely villous; leaf-blades orbicular in outline, 2 to 4 lines long, once or twice palmately divided into linear or obovate lobes, the petioles 1 to 5 lines long; flowers in a loose terminal cluster; calyx-lobes lanceolate, twice as long as the tube, the tube uniformly submembranous; corolla blue or violet, narrowly funnelform, 7 to 8 lines long, 2 to 3 times as long as the calyx; stamens unequal, equally inserted on the lower part of corolla-throat, the longer equaling the corolla; style equaling corolla or slightly exserted; capsule cells 1-seeded.

Loose rocks of volcanic peaks, 9000 to 10,400 feet, rare: Lassen Peak. North along the Cascade Range to Washington. July-Aug.

Geog. note.—Collomia larsenii is known in California only from the summit of the volcanic cone of Lassen Peak, where it was discovered by J. G. Lemmon and his companion, John Larsen, a frontiersman, in September, 1874. V. K. Chesnut and E. R. Drew obtained it on their climb of the peak in 1889. The present author did not find it on his ascent of Lassen Peak on June 8, 1910, the season being too early, nor on June 22, 1927, the peak being deep in snow and doubtless with an under layer of ash; nor yet again during his third ascent on September 29, 1929. At this latter time, the mountain top was deeply covered with ash and mud from the volcanic eruptions and no herbaceous vegetation was found above the 9300 foot level. The alpine and sub-alpine herbs had been, apparently, destroyed, including such rare endemics as Draba aureola and Collomia larsenii. Northward, Collomia larsenii has been collected on the summits of several volcanic peaks of the Cascade Range as follows: Three Sisters, Ore.; Mt. Jefferson, Ore., *Gorman;* Mt. Hood, Ore.; Mt. Adams, Wash., *Parry;* Mt. Rainier, Wash., *Piper* 456.

Refs.—COLLOMIA LARSENII Payson, Univ. Wyo. Publ. Bot. 1:85, fig. 4 (1924); Jepson, Man. 785 (1925). *Gilia larsenii* Gray, Proc. Am. Acad. 11:84 (1875), type loc. Lassen Peak, *Lemmon & Larsen.* *C. debilis* var. *larsenii* Brand; Engler, Pflzr. 4^{250}:52 (1907). *Gilia debilis* var. *larsenii* Mcbr., Contrib. Gray Herb. 56:57 (1918).

7. GILIA R. & P.

Annual or sometimes perennial herbs. Leaves alternate or disposed in a basal tuft or rosette, pinnately toothed, lobed, or divided, or sometimes entire. Calyx-teeth usually equal, the tube scarious below the sinuses, usually ruptured by the growing capsule. Corolla funnelform to salverform or campanulate, blue, yellow, white or red, the lobes mostly shorter than the tube, the stamens equally (rarely unequally) inserted on its throat or in the sinuses. Capsule 3-celled and 3-valved, the seeds many, rarely few or one.—Gilia gracilis has opposite leaves. In Gilia gracilis and in G. gilioides the stamens are unequally inserted; in all other species of the genus equally inserted.—Species about 60, North and South America. (Felipe Luis Gil, Spanish botanist of the latter half of the 18th century.)

A. Plants perennial (or rarely biennial); see also no. 17.

Flowers scarlet (pink or yellowish); inflorescence elongated or thyrsoid.................1. *G. aggregata.*
Flowers white; inflorescence capitate.................2. *G. congesta.*

B. Plants annual.

I. CELLS OF CAPSULE SEVERAL-SEEDED, THE SEEDS SMALL.

1. Corollas funnelform to tubular.

a. Inflorescence leafless or the leaves sparse and reduced or bract-like.

Leaves narrow and entire or mostly so; flowers cymose or paniculate; montane, Sierra Nevada and North Coast Ranges (and S. Cal. mts.).
Corolla purple to magenta, 4 to 9 lines long.................3. *G. leptalea.*
Corolla white, 2 to 3 lines long.................4. *G. capillaris.*
Leaves pinnately or bipinnately lobed or divided, or the blades with the margin merely toothed.
Lobes or teeth of the leaves longer than broad, the blades glandular or non-glandular; seeds mucilaginous when wetted.
Leaves basal or mostly so, the cauline leaves few and reduced or bract-like.
Basal leaves not glandular, petioled.
Basal leaves pinnately or bipinnately cleft or lobed or divided into usually many to numerous segments; cauline leaves few and reduced, petioled; corolla blue, purple, pink or white; flowers pedicelled in mostly loose cymes or panicles.................5. *G. tenuiflora.*
Basal leaves pinnately divided into 5 to 9 lobes, the cauline leaves sessile, palmately divided into 3 to 5 lobes; corolla yellow, 2 to 4 lines long; Mohave Desert, Mt. Piños region, s. Sierra Nevada in Kern Co., Inyo Co.................6. *G. ochroleuca.*
Basal leaves glandular, petioled, the cauline sessile; corolla 4 to 6 lines long; e. Mohave Desert and Inyo Co.................7. *G. scopulorum.*
Leaves more or less equally distributed along the stem, the blades pinnately or bipinnately dissected into filiform or linear (rarely broad) segments.
Flowers in large dense heads, the heads usually spherical; hyaline intervals of calyces typically broader than the longitudinal herbaceous ribs or bands.
Corolla-throat shorter than the tube; stamens exserted.
Corolla blue or white; calyx turbinate, ruptured in fruit; heads about 15 to 50-flowered.
Plants slender; corolla-lobes linear; mostly North Coast Ranges and n. Sierra Nevada.................8. *G. capitata.*

Plants rather stout; corolla-lobes ovate to oblong; South Coast Range and cent. and s. Sierra Nevada and s. to San Diego Co.......... 9. *G. staminea.*
Corolla very dark blue; calyx inflated, not ruptured by fruit; coast line sand dunes..........10. *G. chamissonis.*
Corolla-throat longer than the tube; stamens included; heads about 5 to 15-flowered; mostly near the coast from Santa Clara Co. to Los Angeles Co..........11. *G. achilleaefolia.*
Flowers 2 to 10 in cymes or loose clusters or solitary; hyaline intervals of calyces typically narrower than the longitudinal herbaceous bands; stamens usually shorter than corolla-lobes.
Corolla blue or white (sometimes with 5 purple spots in throat), the limb mostly narrow and little spreading, 1 to 3 lines broad; flowers in clusters or heads, or often solitary and loosely scattered, medium sized or inconspicuous.
Corolla funnelform; capsule oblong-ovate, 2 lines long; Coast Ranges and coastal S. Cal. (mainly back of coast line)........12. *G. multicaulis.*
Corolla tubular (or slightly widened upward); capsule oblong, 3 to 4 lines long; coast line sand dunes from Sonoma Co. to Del Norte Co....... 13. *G. inconspicua.*
Corolla tricolored, the limb broader and spreading, 5 to 9 lines broad; flowers in terminal cymes, showy; Coast Ranges and Sierra Nevada.................. 14. *G. tricolor.*
Lobes or teeth of leaves (exclusive of spines at tip) broader than long, the blades always glandular; seeds not mucilaginous when wetted; transmontane deserts.
Leaves oblanceolate or linear, dentately toothed or pinnately lobed; capsules usually well exceeding the calyx; corolla 2 to 3 lines long..........15. *G. leptomeria.*
Leaves orbicular to obovate, coarsely spiny-dentate or some (especially the lower) pinnately cleft and divided; corolla 3½ to 5 lines long; capsules merely equaling or shorter than calyx.
Stems leafy to middle or up to inflorescence; stamens inserted at middle of corolla-tube, exserted from corolla-throat..........16. *G. latifolia.*
Stems leafy only at base or sub-basally; stamens inserted near base of corolla-tube, included in the corolla-tube..........17. *G. gilmanii.*

b. Inflorescence densely leafy, the leaves surpassing or equaling the flowers; transmontane deserts.

Leaves mostly entire, the basal ones always so; flowers both glomerate and solitary, the glomerules terminal, the lower flowers solitary..........18. *G. depressa.*
Leaves pinnatifid, especially the basal; flowers in dense terminal heads, none solitary...................... 19. *G. polycladon.*

2. Corollas campanulate or turbinate; desert species.

Corolla cleft ⅓ or nearly ½ to base, white.
Stamens inserted near base of corolla-tube; corolla 3 to 4 lines long, its throat yellowish........ 20. *G. campanulata.*
Stamens inserted in corolla-throat near sinuses; corolla 1¼ lines long, its throat whitish.......... 21. *G. micromeria.*
Corolla cleft nearly to base or at least ⅔ the way to base.
Leaves ovate to oblanceolate, the basal ones largest; corolla white, the throat yellow................ 22. *G. inyoensis.*
Leaves filiform, the upper ones equaling or longer than the lower; corolla yellow...................... 23. *G. filiformis.*

II. Cells of capsule usually one-seeded (cf. also no. 21); cismontane and transmontane.

Leaves all entire, mostly opposite; corolla salverform..........24. *G. gracilis.*
Leaves pinnatifid or trifid (rarely some entire), all alternate; corolla tubular-funnelform................ 25. *G. gilioides.*

1. **G. aggregata** Spr. Scarlet Gilia. Skyrocket. (Fig. 379.) Stems 1 or several from the perennial or biennial root-crown, erect and usually simple, 1 to 3¼ feet high; herbage thinly puberulent or villous or glabrate, often slightly glandular, the leaves beneath usually somewhat villous; leaf-blades pinnately divided into linear segments, the segments microscopically bristle-tipped, ½ to 1½ inches long, rather remote or those of the basal leaves crowded; petioles ¼ to 1½ inches long; flowers in an elongate thyrse; calyx 1½ to 3 lines long, its lanceolate lobes 1½ to 2 times as long as the tube; corolla salverform, commonly scarlet but varying to salmon, pink and white (the lobes mottled with yellow), ¾ to 1¼ inches long,

the subcylindric tube 2 to 5 times as long as the calyx, the lobes usually lanceolate-acuminate or linear-acuminate, 4 to 5½ lines long, rotate, becoming reflexed; stamens unequal, exserted, frequently declined, the filaments inserted in the throat just below the sinuses; capsule ovoid, the cells many-seeded; seeds flat, showing spiricles when wetted.

Moist sandy flats or loose gravelly soil in opens or openly wooded ridges, 4000 to 10,000 feet: North Coast Ranges from Del Norte Co. and western Siskiyou Co. to Lake Co.; Sierra Nevada from eastern Siskiyou Co. and Modoc Co. to Inyo Co. South to Mexico, east to Texas, Colorado and Montana, north to British Columbia. June-Aug.

Field note.—Although dispersed over so vast an area in western North America and growing in such widely unlike habitats climatically and ecologically, Gilia aggregata is an extremely constant species in vegetative organs and in the character of its flowers and inflorescence. Notwithstanding its wide horizontal distribution, its altitudinal range in any one mountain transect is, however, extremely limited. In the Sierra Nevada it is common in moist flats of the California Red Fir belt.

Locs.—North Coast Ranges: Poker Flat, w. Siskiyou Mts., *Jepson* 18,566; Log Lake, Shackleford Creek, Marble Mts., *Butler* 134; Sisson, Siskiyou Co., *Jepson* 21,100; Corral Prairie, Trinity Summit, *Tracy* 10,440; Lasseck Peak, Humboldt Co., *Goddard* 683; South Yollo Bolly, *Jepson* 21,099; Snow Mt., Lake Co. (Zoe 4:174). Sierra Nevada: Goosenest Mt., e. Siskiyou Co., *Butler* 945; Lily Lake, Warner Mts., Modoc Co., *L. S. Smith* 950; Brokeoff Mt., near Lassen Peak, *J. Grinnell;* Warner Creek, Plumas Co., *Jepson* 12,309; Spanish Peak, Plumas Co., *Jepson* 19,320; Keddie, Plumas Co., *W. I. Follett* 98; Rich Point, Middle Fork Feather River, *Jepson;* Sierraville, *Alma Ames* 32; Big Mdw., Calaveras Co., *Jepson* 10,137; Deadmans Creek, Middle Fork Stanislaus River, *Jepson* 6573; Rancheria Mt., Tuolumne Co., *Jepson* 4585; Jackass Mdws., South Fork San Joaquin River, *E. Ferguson* 409; Rock Creek, Inyo Co., *Almeda Nordyke;* Hunters Flat, Lone Pine Cañon, Inyo Co., *Renner* 69.

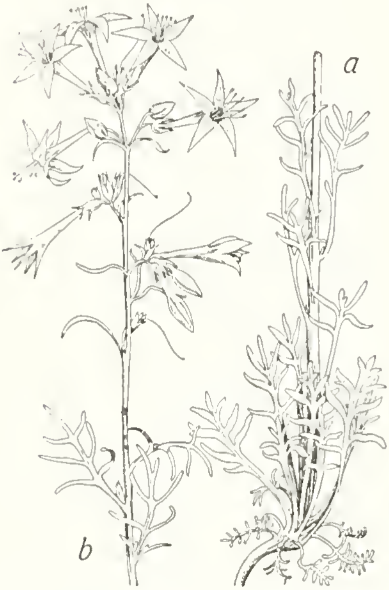

Fig. 379. GILIA AGGREGATA Spr. *a*, lower part of plant; *b*, infl. × 1½.

Var. **bridgesii** Gray. Stems spreading or decumbent at base, 6 to 18 inches long, the base woody; leaves often glabrate, the segments more obtuse; corolla bright rose-purple, not yellow-mottled (but fading in drying and then sometimes mottled), its lobes ovate or oblong-ovate; stamens less exserted.—Sierra Nevada from Tuolumne Co. to Tulare Co. "Inconstant except in corolla color, it is different in habit from the erect form of the species. It is notable that in the southern Sierra Nevada where var. bridgesii occurs on the west slope, typical Gilia aggregata is for the most part found on the east slope."—R. F. Hoover.

Locs.—Middle Fork Tuolumne River, *Evans;* Crane Flat, Mariposa Co., *Jepson* 4649; Kaiser Peak, Fresno Co., *A. L. Grant* 1424; Tombstone Ridge near Gnat Mdw., Fresno Co., *E. Ferguson* 542; Giant Forest, *Jepson* 670 (Round Mdw.), *Newlon* 62 (Moro Rock).

Var. **texana** (Greene) Jepson comb. n. Low, erect (mostly 3 to 6 inches high); leaves more villous, the segments crowded.—Eastern Mohave Desert: Gilroy Cañon, Providence Mts., *Jepson* 18,261; Keystone Spr., New York Mts., *Munz* 13,873. East to Texas.

Refs.—GILIA AGGREGATA Spr., Syst. Veg. 1:626 (1825); Jepson, Man. 794, fig. 771 (1925). *Cantua aggregata* Pursh, Fl. 147 (1814), type from "the banks of the Mississippi" (that is, doubtless, the upper Missouri River), *Lewis. Batanthes aggregata* Raf., Atlantic Jour. 145 (1832); Greene, Lflts. 1:224 (1906). *Collomia aggregata* Porter; Rothr., Bot. Wheeler 198 (1878). *Callisteris aggregata* Greene, Lflts. 1:159 (1905). *Ipomopsis elegans* Lindl., Bot. Reg. t. 1281 (1829); not Michx. *G. aggregata* subsp. *eu-aggregata* Brand; Engler, Pflzr. 4^{250}:115 (1907). *G. aggregata* subsp. *eu-aggregata* var. *typica* Brand, l.c. Var. BRIDGESII Gray, Proc. Am. Acad. 8:276 (1870), type collected by *Bridges*, doubtless in Mariposa Co. *Callisteris bridgesii* Greene, l.c. 160. *G. aggregata* subsp. *bridgesii* Brand; Engler, Pflzr. 4^{250}:116 (1907). Var. TEXANA Jepson. *Callisteris texana* Greene, Lflts. 1:160 (1905), type loc. Guadalupe Mts., w. Tex., *V. Havard. G. aggregata* var. *bridgesii* Jepson, Man. 794 (1925), as to Mohave Desert plants; not Gray.

2. **G. congesta** Hook. Stems few to many, simple or branched, erect or ascending, 2 to 10 inches high; herbage sparingly villous or somewhat floccose-villous; leaves pinnately (rarely bipinnately) divided into 4 to 7 lobes but frequently with only 3 lobes, the lobes linear, revolute-margined, cuspidate, 1 to 3 lines long, often crowded at the end of the dilated petiole; flowers in dense bracteate capitate clusters, the clusters 5 to 7 lines broad, solitary and terminal or 2 to 5 and corymbosely arranged; calyx about equaling the corolla-tube, its lobes linear, cuspidate, villous-pubescent, about ⅓ as long as the tube; corolla short-salverform, white, 2½ to 3 lines long, its tube 1½ lines long and the lobes about as long; stamens evidently but not conspicuously exserted, the filaments inserted in the corolla-sinuses; capsule oval, about 1 line long, 1 to 3-seeded; seed-coats changing when wetted.

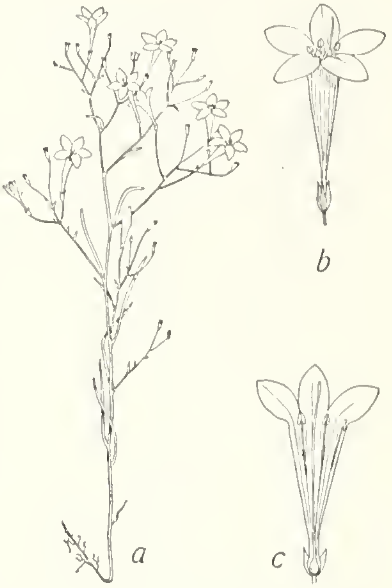

Fig. 380. Gilia leptalea Greene. *a, habit,* × ½; *b,* fl., × 2; *c,* long. sect. of fl., × 2.

Dry ridges and flats or plateaus, mainly transmontane, 2500 to 8000 feet: Sierra Nevada from Nevada Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges in western Siskiyou Co. East to Colorado and Montana, north to Idaho and Washington. June–Aug.

Locs.—Northern Sierra Nevada: Truckee, Nevada Co. (Am. Jour. Bot. 23:438); Pine Creek, Lassen Co., *M. S. Baker;* Thousand Lakes Basin, ne. Shasta Co., *Peirson* 10,201; Forestdale, Modoc Co., *M. S. Baker;* Mt. Bidwell, Warner Mts., *Manning* 345. Western Siskiyou Co.: Montague, *T. Brandegee;* Marble Mt., *Chandler* 1666. Such collections represent the loose form of mostly lower altitudes. It intergrades freely into the congested high montane (probably environmental) form described as follows:

Var. **montana** Constance & Rollins. Caespitose plant, the leaf-rosettes of sterile shoots forming matted cushions.—High montane (8500 to 12,000 feet) in the northern Sierra Nevada on easterly summits, slopes or plateaus from Mono Co. to Shasta Co., and also on the east side (transmontane) from Inyo Co. to Modoc Co.: Waucoba Cañon, Inyo Mts. (Am. Jour. Bot. 23:440); McAfee Mdw., White Mts., *Duran* 558; Sonora Pass, *Brewer* 1883; Silver Mt., Alpine Co., *Brewer* 2053; Squaw Peak, Placer Co., *C. J. Fox Jr.;* Castle Peak, Nevada Co., *Sonne;* Lassen Peak, *Lemmon* 1203; Squaw Peak, Warner Mts., *L. S. Smith* 1052. East to Washoe Co., Nev., and north to Klamath and Harney Cos., Ore.

Refs.—Gilia congesta Hook., Fl. Bor. Am. 2:75 (1838), type loc. "sandy plains of the Columbia" River, *Douglas;* Jepson, Man. 794 (1925). Var. montana Constance & Rollins, Am. Jour. Bot. 23:439 (1936). *G. montana* Nels. & Kenn., Proc. Biol. Soc. Wash. 19:37 (1906), type loc. summit of Mt. Rose, Washoe Co., Nev., *Kennedy* 1170. *G. congesta* subsp. *palmifrons* Brand; Engler, Pflzr. 4^{250}:122, fig. 26 (1907), Camp Harney, e. Ore., *Cusick* 869.

3. **G. leptalea** Greene. (Fig. 380.) Stem freely and divaricately, often dichotomously branched or sometimes simple, erect, 2 to 12 inches (or to 2¼ feet) high, the leaves scanty, all cauline, the lowest pairs of leaves opposite but these early disappearing; herbage glabrate to puberulent, microscopically glandular; leaves subfiliform or narrowly linear or narrowly lanceolate, entire (very rarely incised), ½ to 1¼ inches long, mostly ¼ to ⅓ (or 1) line wide, often somewhat fascicled; flowers diffusely cymose, borne on filiform pedicels 2 to 10 lines long; calyx 1¼ to 2 lines long, its lobes ½ to as long as the tube, the hyaline intervals broad; corolla rose to purple or magenta, funnelform, 4 to 9 lines long, the tube very narrow, dilated into a large throat; throat light or whitish, often with blue markings, the tube yellowish; stamens included or exserted, more or less unequal, the filaments inserted in the corolla-throat; capsule oblong, its cells 2 to 4-seeded; seeds showing spiricles when wetted.

Sandy open slopes, sandy flats or forest swales in the mountains or in glacial valleys, (2000 or) 4000 to 9000 feet, common: North Coast Ranges from Humboldt Co. to Lake Co.; Sierra Nevada from eastern Siskiyou Co. to Tulare Co. June-Aug.

Geog. note.—One of the most abundant species of the Transition and Canadian zones in the Sierra Nevada is Gilia leptalea. The plants, developing in the montane spring of June and July, are usually only 1 to 2 or 3 inches high, but occur in countless millions of individuals, color lightly the opens here and there, empurple broad aisles in the forest and form marked colonies in the glacial valleys. It is vastly more abundant than Gilia capillaris which is relatively infrequent. Sometimes the lower leaves are sparingly toothed.

Locs.—North Coast Ranges: Hyampum, Trinity Co., *Chesnut & Drew;* Buck Mt., Humboldt Co., *Tracy* 2920; betw. Castle Peak and Middle Eel River, ne. Mendocino Co., *Jepson* 15,082; Middle Creek, base of Elk Mt., nw. Lake Co., *Jepson* 15,085; Glenbrook, sw. Lake Co., *Jepson* 15,084; Mt. St. Helena (n. side), *Tracy* 2242. Sierra Nevada: Mt. Shasta, *F. W. Morse;* Dana, ne. Shasta Co., *Jepson* 5754; Martin Sprs., Eagle Lake, *Brown & Wieslander* 86; betw. La Loma and Little Summit, Butte Co., *Heller* 11,590; Meadow Valley, Plumas Co., *Fritz & Harris;* Bear Valley, Nevada Co., *Jepson* 21,241; French Mdws., Middle Fork American River, Placer Co., *L. S. Smith* 1679; Glen Alpine Sprs., Eldorado Co., *Ottley* 781; Cascade Creek, Middle Stanislaus River, *Jepson* 6526; Calaveras Grove, *Jepson* 10,078; Rodgers Creek, Tuolumne River, *Jepson* 3387; Mather, near Hetch-Hetchy, *Jepson* 4619; Yosemite, *Jepson* 21,067; Devils Postpile, Madera Co., *A. L. Grant* 1557; Huntington Lake, Fresno Co., *A. L. Grant* 1463; J. O. Pass, near Mt. Silliman, *Jepson* 736.

Refs.—GILIA LEPTALEA Greene, Erythea 4:58 (1896); Jepson, Man. 798, fig. 775 (1925). *Collomia leptalea* Gray, Proc. Am. Acad. 8:261 (1870), based on Sierra Nevada material "from Plumas to Mariposa Co.," the first cited collection that of *Bridges.*

4. **G. capillaris** Kell. Stem erect, commonly branching above, 2 to 9 inches high; leaves linear to narrow-lanceolate, entire, 4 to 12 lines long, mostly ½ to 1 line wide; calyx ½ as long as corolla, cleft to middle into subulate cuspidate lobes; corolla white or pink, tubular-funnelform, 2 to 3 lines long, the tube much less conspicuously dilated than in G. leptalea.

Moist northerly slopes or half-shaded areas: cismontane Southern California; Sierra Nevada, 4000 to 8500 feet, from Tulare Co. to Modoc Co.; North Coast Ranges, 2500 to 6000 feet, in Humboldt, Trinity and Siskiyou Cos. North to Washington, east to Colorado. June-Aug.

Tax. note.—It is evident that Gilia capillaris and Gilia leptalea are closely related but, although seeming so very close, they are in this treatment held distinct. Field evidence is, here, of interest. In 1923 Gilia leptalea was collected near Silver Lake in Silver Valley, Alpine Co. (*Jepson* 10,093); near it Gilia capillaris was also found (*Jepson* 10,099). On the basis of living colonies in this locality contrasting characters for these two species were worked out in the field and are summarized as follows:

Gilia leptalea (no. 10,093), (a) leaves acicular; (b) foliage scanty; (c) herbage thinly glandular; (d) calyx lobes subulate or narrow-lanceolate, acuminate; (e) calyx-tube narrow-elliptic, the scarious intervals indefinitely separated by pale greenish-yellow nerves; (f) corolla bright pink with a brown-purple spot on the base of each lobe, 4 lines long; (g) corolla-throat funnelform; (h) corolla-limb 3 lines broad; (i) anthers yellow; (j) style reaching the tips of corolla-lobes.

Gilia capillaris (no. 10,099), (a) leaves narrow but expanded; (b) foliage moderately abundant; (c) herbage densely glandular; (d) calyx-lobes acicular or linear, cuspidate; (e) calyx-tube oblong, the scarious intervals separated by sharply defined green nerves; (f) corolla pale blue or whitish, 2½ lines long; (g) corolla-throat broadly clavate; (h) corolla-limb 1 line broad; (i) anthers blue; (j) style reaching the middle of corolla-lobes.

This tabulation represents a considerable array of morphologic difference. While some of these characters are not invariable, the sum totals furnish differentiation. Gray considered Gilia leptalea and Gilia capillaris synonymous, while Brand makes G. capillaris a subspecies of G. leptalea and states there are intermediate forms. The more recent research in California favors the preservation of both as distinct specific units. To this statement of the case may be added the following note: "I have seen no plants which seem to be intergrades or which cannot be referred with certainty to the one species or the other. While Gilia capillaris has a wider geographic range than Gilia leptalea (a species restricted to California), it is comparatively a rare plant, although it may be overlooked as a small-flowered form of Gilia leptalea."—R. F. Hoover.

Locs.—S. Cal.: Palomar, San Jacinto and San Bernardino mountains and Mt. Piños, acc. *P. A. Munz.* Sierra Nevada: Frog Mdw., Greenhorn Mts., *C. N. Smith* 33; Middle Tule River, *Purpus* 5130; Alta Mdws., Tulare Co., *Newlon* 23a; Mt. Buena Vista, Mariposa Co., *Congdon;* Big Mdw., North Fork Stanislaus River, Calaveras Co., *Peirson* 11,544; Silver Valley, Alpine Co., *Jepson* 10,099; Bear Valley, Amador Co., *Hansen;* Donner Lake, Nevada Co., *Heller* 7042; Pine

Creek, Lassen Co., *Nutting;* Big Valley, near Lookout, Modoc Co., *Baker & Nutting.* North Coast Ranges: Yollo Bolly Mts., *T. Brandegee;* Humboldt Co., *Tracy* 8864 (Brannan Mt.), 7679 (Horse Mt.), 3365 (betw. Three Creeks and Willow Creek), 10,374 (Trinity Summit); Union Creek, Salmon Mts., *Hall* 6595; Poker Flat, w. Siskiyou Mts., *R. Van Deventer* 267; Klamathon, Siskiyou Co., *Copeland* 3560.

Refs.—GILIA CAPILLARIS Kell., Proc. Cal. Acad. 5:46 (1873), type loc. Cisco, Placer Co., Sierra Nevada, *Kellogg;* Jepson, Man. 799 (1925). *G. leptalea* subsp. *capillaris* Brand; Engler, Pflzr. 4^{250}:98 (1907). *G. linearifolia* Howell, Fl. Nw. Am. 461 (1903), type from s. Ore. *G. subalpina* Greene; Brand, l.c., type loc. Donner Lake, *Heller* 7042.

5. **G. tenuiflora** Benth. (Fig. 381.) Stem erect, paniculately branching above, 7 to 20 inches high, glabrous or glandular-puberulent above; leaves mostly basal, 1 to 2 inches long, glabrous or puberulent, the blades once or twice pinnately divided into small segments ½ to 1 line long; flowers on short or long pedicels in a loose panicle or cyme, solitary or clustered; calyx 1 to 2½ lines long, its intervals scarious, its acute teeth ¼ to ½ as long as the tube; corolla funnelform, purple with dark purple throat, 3 to 8 lines long, its tube usually not exceeding the calyx (sometimes 2 to 3 times as long), gradually enlarged into the throat (in type) or sometimes abruptly expanded, the throat usually much longer than the tube, the limb 3 to 5 lines broad; stamens unequal, included or slightly exserted, the filaments equally inserted below the corolla-sinuses; capsule many-seeded, equaling or exceeding the calyx; seed-coats developing mucilage when wetted.

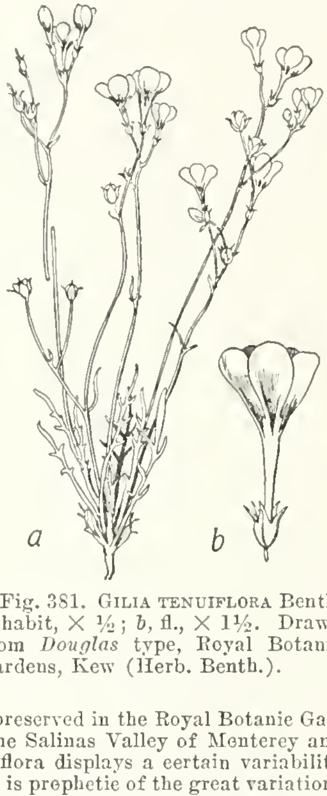

Fig. 381. GILIA TENUIFLORA Benth. *a*, habit, × ½; *b*, fl., × 1½. Drawn from *Douglas* type, Royal Botanic Gardens, Kew (Herb. Benth.).

Sandy flats and hill slopes, 50 to 2200 feet: South Coast Ranges from Santa Clara Co. to San Luis Obispo Co. and Santa Rosa Isl. Apr.-June.

Locs.—Coyote sta., Santa Clara Co., *Jepson* 15,086; Mission Soledad, Monterey Co., *Jepson* 8434a; upper San Antonio River, Monterey Co., *Jepson* 1657; betw. Bradley and San Miguel, Salinas Valley, *Wieslander;* Paso Robles, *Barber;* Cholame, e. San Luis Obispo Co., *Jepson* 16,189; Elkhorn Scarp, se. San Luis Obispo Co., *Jepson* 16,231; Old Ranch Cañon, Santa Rosa Isl., *Hoffmann.*

Geog. note.—The type of Gilia tenuiflora Benth. is a Douglas plant from California and therefore came from the Coast Ranges, most likely from Monterey Co. or San Luis Obispo Co., since a collection made on the Mission Trail at Paso Robles (*Barber*) matches very closely the type preserved in the Royal Botanic Gardens at Kew. Even within the somewhat narrow limits of the Salinas Valley of Monterey and San Luis Obispo counties and its bordering hills, Gilia tenuiflora displays a certain variability as to herbage and relative length of corolla-tube and calyx that is prophetic of the great variations found in the species southward and in the transmontane deserts. In these regions it breaks into a large number of diverse forms exhibiting corolla variables and leaf variables. So great is the variability in size and shape of corolla and in leaf structure that the extremes, often published as species, might well be regarded as valid species save for the truly overwhelming number of intergrade forms representing not one or a few but many phases of intergradation. Two marked leaf types frequently occur: (a) leaf-lobes of the pinnately divided leaves narrow and long and entire or sparingly laciniate-toothed or -lobed; and (b) leaf-lobes short and broad and pinnately divided, the sinuses rounded and the lobes mainly obtuse. Each leaf type develops secondary types. Each secondary type tends to be associated with two main corolla forms, one with long tube, one with short tube. Brought into this complex also are plants with corollas of varying sizes, but varying like length of corolla-tube independently of the leaves or other organs. Pubescence, glabrosity and glandulosity are less easily describable but continuous variables, which like the other variables are usually devoid of geographic correlations.

As here described Gilia tenuiflora is an inclusive species, evaluated as an indivisible unit within which variation is very great, continuous and without constant coordination or correlations of variable factors. It is the kind of complex which is frequently spoken of by taxonomists as "hopelessly confused," "deeply entangled" or "an aggregate of numerous hopelessly intergrading races." Continued field study over wide areas for several decades gives, however, a contrary impression. Such developments should not be regarded as odious because defeating formal systematic methods. The numerous small races of Gilia tenuiflora in its broad sense seem to represent symmetrical fragments of a large pattern. If so, aggregates of this sort would seem to offer a highly tempting field of exploration to the systematic botanist who can evolve a suitable method of experiment and study. Meanwhile, it here seems desirable to describe the variations of various organs and to describe under varietal names such extreme phases of subspecific races as it is possible to segregate geographically and to some extent morphologically, that is, limiting description to the most characteristic collections.

Leaf size varies relatively little, but leaf segmentation varies greatly—especially in depth of segmentation and in shape and spacing of the segments: (a) In pinnately divided leaves with long segments, the segments may be acute, discrete, remote or crowded, linear and entire or mostly sparingly toothed, or again the leaves may be saliently or laciniately pinnate-toothed with the rachis broad. (b) In pinnately divided or lobed leaves the short segments may be obtuse, approximate or crowded, merely toothed or again pinnately parted or divided. Two diverse leaf forms may often be found in one collection. For example, pectinately pinnatifid leaves and entire leaves may be found in one colony, as in Pacoima Cañon, San Gabriel Mts., *Peirson* 385. Simply pinnate and twice pinnate leaves occur in such material as Mission Soledad, Salinas Valley, *Jepson* 8434a.

The flowers vary greatly also, not merely in one collection but even on a single individual—in size of corolla and especially as to relative length of corolla-tube and throat. Two collections may seem to belong to one close taxonomic unit, save that in some one flower factor they may differ markedly, as in relative length of corolla-tube and corolla-throat (San Jacinto Cañon, San Jacinto Mts., *Jepson* 1284, the corolla-tube not exceeding calyx; Mt. Wilson, *Peirson* 155, the corolla-tube 1½ times as long as the calyx). Conversely two collections may agree in flowers and in other features but differ in leaves. These two factors, flower-shape and leaf-shape, do not, therefore, necessarily vary together, nor do they characterize forms with geographic meaning.

Certain broad features of Gilia tenuiflora are fairly constant. The position of the stamens, the structure of the calyx, the loose inflorescence, the position of the leaves (that is mostly in a basal tuft) are the characters which may be weighed as most dependable. It seems impracticable to delimit proper varieties or subspecies. Instead a number of the extremes have been described in as nearly precise terms as may be, and accorded varietal names for the sake of convenience. Only by some such means can the extent and diversity of the complex contained within the species be at all adequately presented in this treatment. Gilia tenuiflora, proper, representing the taxonomic type, is here limited to the South Coast Ranges and is segregated geographically, although two varieties, var. arenaria and var. latiflora, occur on the borders of its territory.

It would appear from a study of Gilia tenuiflora as a whole that reduction or increase in plant size, development of glandulosity, marked leaf-segmentation, variations in distribution of pubescence, reduction in corolla size or striking elongation of corolla-tube may have arisen independently at many different points in the series and thus have brought into close simulation elements of different origin genetically. The forms described varietally below may not be in every case, as to entire content, natural races or only partially such, but a descriptive treatment is needed because of the circumstance that the differences among the several forms are so great in their extreme expression. Such extremes are more unlike than some units of the genus accepted as species. These varieties are, to be sure, of unequal value, as will appear from the manner of treatment. Moreover, all seem to merge by intergrades one with another, mostly on a broad front. They are here described as follows:

Var. **arenaria** (Benth.) Jepson comb. n. Stems 1 or several from the base, ascending, 1 to 5 inches high, these and the pedicels and calyx densely clothed with short spreading gland-tipped hairs; leaves pinnately divided to shallowly toothed, or the leaves merely toothed above or subentire, ¾ to 1½ inches long, mainly basal; flowers racemosely cymose, the pedicels short (½ to 7 lines long); corollas 4½ to 5 lines long.—Sand dunes, Monterey Bay: Seaside near Del Monte, *Heller* 6651. The type collection, made by Douglas, is at Kew. It consists of a single dwarf plant two inches high. It is exactly matched as to characters by *Elmer* 3556, Pacific Grove. The leaves in the type resemble in miniature a double-edged woodman's saw; the basal leaves are glabrous and non-glandular; the stems, pedicels and calyces are clothed with short gland-tipped hairs.

Var. **exilis** (Gray) Jepson comb. n. Stems ½ to 2 feet high, narrowly paniculate or often bushy-paniculate, the branchlets slender or filiform; leaves small, mainly basal, 1 to 3 times pinnately parted with the segments mostly long-linear, or the blades rarely entire; corolla 3 to 5 lines long, its tube very slender, little exceeding the calyx (mostly 1¼ times as long), the limb broad (2 to 4 lines) relatively to the size of the flowers.—Mountain slopes, mesas and valley flats, mostly 800 to 5500 feet: cismontane Southern California.

The prevailing form of the Gilia tenuiflora complex in cismontane Southern California is var. exilis. Its flowers display corollas with the throat gradually but strongly expanded and the tube about 1½ times as long as the calyx. Var. exilis intergrades freely with var. grinnellii of the San Gabriel Mts., remarkable for its extremely long corolla-tube, and with forms of var. sinuata of the Mohave Desert, the intergrades as easily referable to one named form as the other. This form, var. exilis, is noteworthy for its altitudinal range; it occurs at Mission San Luis Rey at 100 feet, on Tahquitz Peak in the San Jacinto Mts. at 8000 feet, and on the summit of Mt. Piños, 8000 feet.

Locs.—Seymour Creek, Mt. Piños, n. Ventura Co., *Munz* 6945; Portal Ridge, n. Los Angeles Co., *Jepson* 17,060; Kentucky Sprs., Santa Monica Mts., *Barber* 208; Mt. Wilson, San Gabriel Mts., *Peirson* 155; Mill Creek (mouth), San Bernardino foothills, *Parish* 2043; San Jacinto Valley, *Jepson* 1270; Strawberry Valley, Mt. San Jacinto, *Jepson* 1300b; Thomas Valley, San Jacinto Mts., *Jepson* 1316; Hemet Valley, San Jacinto Mts., *C. V. Meyer* 774; Temescal Cañon, sw. Riverside Co., *Jepson* 19,132; Cootea, Palomar Mt., *Jepson* 1520; San Luis Rey, San Diego Co., *Cleveland.*

Var. **grinnellii** (Brand) Jepson comb. n. Leaves mainly basal or sub-basal, ½ to 1¼ inches long, thin, twice pinnately dissected into small (¼ to ¾ line long) crowded segments; corolla red, 7 to 12 lines long, the tube 3 to 9 times as long as the calyx.—San Gabriel Mts.: Icehouse Cañon, *Peirson* 457; West Fork San Gabriel River, *Peirson* 286; Rock Creek Divide, *Peirson* 2485. This is a remarkably striking phase published as a species by Brand. But length of corolla-tube is so extremely unstable in this group that the weakness of this form, even as a variety, is perhaps too great.

Var. **altissima** Parish. Stems 1 or few, strictly erect, 1½ to 2 feet high, leafy at base and on lower part; leaves bipinnately divided into fine somewhat crowded segments, the segments ¼ to 1 line long; corolla 3 to 3½ (or 10) lines long.—Inner valleys and montane slopes and flats, 1200 to 6400 feet, coastal Southern California from northern Ventura Co. and the interior mountains of Santa Barbara Co. to the San Bernardino Mts. and western Riverside Co.

Gilia tenuiflora var. altissima is a tall or robust plant, the leaves large with long-linear often crowded segments and the stem leafy on lower part and at base. It inhabits a distinctive phytogeographic area but is relatively uncommon. Stations are cited as follows: Mt. Piños, *W. B. Holt;* San Rafael Mts., *H. & M. Dearing* 1438; McKinley Mt., *Hoffmann;* betw. Lake Arrowhead and Big Bear Lake, *H. & M. Dearing* 1436; San Bernardino, *Parish;* Colton, *Cleveland;* Elsinore (5 mi. n.), *Jepson* 12,434.

Var. **caruifolia** Munz. Stem erect, paniculately branching above, 1½ to 2 feet high; the leaves basal and on lower part of stem; herbage glabrous or subglabrous and often glaucous, the panicle branches slender or capillary, furnished with scattered tack-shaped glands; leaves 2 to 3 inches long, bipinnately divided into linear segments, the segments short, acute; panicle large, broad, the flowers solitary; corolla purple, 2½ to 3 lines long, its tube included in the calyx or little surpassing it, the throat rather abruptly expanded from the tube (broadly top-shaped), the limb 2 to 2½ lines broad.—Mountain slopes and flats, 4000 to 7000 feet, Laguna and Cuyamaca mountains, San Diego Co.: Laguna Mts., *Cleveland;* Talleys ranch, Cuyamaca, *Dunn;* betw. Julian and Cuyamaca, *K. Brandegee;* Julian, *T. Brandegee.* June-July.

In its best development var. caruifolia is most readily known by its large broad panicle, small corollas with abruptly and broadly dilated throat, and the short-linear segments of its pinnately divided leaves. Although it is not the most extreme form in this aggregate, it possesses more nearly distinct features than any other. While it develops small or dwarfish states, otherwise it seems to be the only form in its area save on the outer margins of its localized range.

Var. **newloniana** Jepson var. n. Stems 1 to several from the base, rather sparingly branched, 8 to 20 inches high; herbage puberulent or villous, often glandular throughout; leaves 2 to 5 inches long, bi- or tripinnately divided into oblong or linear segments, the segments mostly 1 to 3 lines long, remote or discrete, somewhat divaricately spreading; flowers somewhat dichotomously or racemosely cymose; corolla funnelform, 3½ to 4½ lines long, its tube usually included in the calyx, its throat not abruptly expanded.—(Caules ab basi unus vel plures, simplices, 8–20 unc. alti; herba puberulens vel villosa, saepe perglandulosa; folia 2–5 unc. longa, bi- vel tri-pinnatifida, segmentis oblongis vel linearibus, remotis, discretis, 1–3 lin. longis, subdivaricatis; inflorescentia subdichotomo- vel racemoso-cymosa; corolla infundibuliformis, 3½–4½ lin. longa, tubo calyce subbreviore.)—Valley flats and cañon bottoms, 200 to 1500 feet: west and north sides of the Colorado Desert.

In the western Colorado Desert var. newloniana is a plant with large thin leaves twice or thrice pinnately divided or toothed, the segments in their extreme expression very remote and sometimes divaricately curved. It intergrades on the north side of the Colorado Desert with the "stellata" form (G. stellata Hel.) of var. latiflora, a form mainly of the Mohave Desert with more condensed bipinnately divided leaves, the segments somewhat stellately toothed. This "stellata" form in turn intergrades freely with var. latiflora and var. sinuata of the Mohave Desert. The following stations are cited in validation of var. newloniana: Mountain Springs grade, sw. Imperial Co., *Newlon* 377; Vallecito, e. San Diego Co., *Jepson* 8587; Andreas Cañon, San Jacinto Mts., *Newlon* 433 (type); Coral Reef ranch, sw. of Coachella, *Clary* 1623; Deep Cañon, Santa Rosa Mts., *Munz* 11,988; Santa Maria Mts., e. Riverside Co., *Schellenger.*

Var. **sinuata** (Dougl.) Jepson comb. n. Stems 1 or several from the base, erect, branching mostly above, erect or diffuse, 5 to 9 (or 24) inches high; herbage puberulent to glabrous, sometimes tomentose or arachnoid, nearly always furnished above with minute gland-tipped hairs, the stems sometimes glandular throughout, including the pedicels and calyx; leaves ½ to 2¾ inches long, mostly in a basal rosette, usually not glandular, pinnately (sometimes bipinnately) divided into narrow segments, the segments discrete or remote, short or elongated, entire or toothed, or the leaves often merely toothed; cauline leaves reduced and bract-like or the lowermost similar to the basal; flowers loosely cymose-paniculate, borne on slender pedicels; calyx 1 to 2 lines long, equaling corolla-tube to ½ or ⅕ as long, its teeth broadly lanceolate to triangular, usually very acute, its tube with scarious intervals between the ribs; corolla white to blue, purple, pink or red, funnelform, 2½ to 4 lines long, its tube equaling the throat to twice as long; corolla limb 1 to 2 (or 2½) lines broad.—Open sandy or clay valleys, flats and hillslopes, chiefly transmontane, 10 to 5000 (or 8000) feet: northern Colorado Desert; Mohave Desert and mountains on its north side; San Joaquin Valley and its bordering westerly hills; southern Sierra Nevada in Kern Co.; east side of the Sierra Nevada from Inyo Co. to Modoc Co. North to eastern Oregon and eastern Washington, east to Colorado, south to Mexico. Apr.-July.

The prevailing phase of var. sinuata (Gilia inconspicua Dougl.), here treated as almost wholly transmontane and enjoying a very wide range, is a plant with compact basal leaf rosette and naked or nearly naked stems, the cauline leaves mostly reduced or bract-like, the corolla-tube once to twice as long as the calyx. In plant size, in leafage, in inflorescence and in flower color and size it is more variable, perhaps, than any other named variety in this group. The stems usually branch low and the flowering commonly begins low, whereas in var. exilis the flowering panicle tends to be elevated above the basal rosette on a naked stem. In the transmontane deserts, var. sinuata is abundant and has developed an almost endless number of localized strains.

The following citation of stations indicates the wide geographic range of what is here assembled under this name, Gilia tenuiflora var. sinuata. Although so highly variable a subgroup, an attempt has been made to include: (a) only plants with small corollas in which the tube is not exserted from the calyx or only slightly exceeds it (rarely twice as long); and (b) for the most part plants with leaves once pinnately divided, the segments narrow and entire or sometimes short and toothed. Such plants approximate topotypes of the original Gilia sinuata Dougl. from the inner Columbia River region. For California, mainly transmontane collections from the Mohave Desert and along the east side of the Sierra Nevada to Modoc Co. are cited below, but a small-flowered form also occurs in the San Joaquin Valley.

Locs.—Colorado Desert (n. side): Cottonwood Spr., Eagle Mts., *Jepson* 12,556. Mohave Desert: Lancaster, *Jepson* 17,034; Mohave sta. (2 mi. n.), *Jepson* 18,383; Mohave sta. (15 mi. e.), *Jepson* 15,441; Amargo, *Jepson* 15,590; Red Rock Cañon, e. end El Paso Mts., *Krames;* Victorville, *Newlon* 477; Hinkley, *Jepson* 20,603; Calico Wash, near Calico Mts., *Jepson* 17,211; Kessler Peak, Ivanpah Mts., *Jepson* 15,835; New York Mts., *Jepson* 5476. Ranges on north side of Mohave Desert: Frazier Mt., *Hoffmann;* Fort Tejon, *Davy* 2377; Caliente (hills near), Tehachapi Mts., *Davy* 1877; Piute Mts., Kern Co., *C. N. Smith* 164. San Joaquin Valley and its bordering westerly hills (discovered and determined by R. F. Hoover): Shafter, Kern Co. (7 mi. se.), *Hoover* 1843; mouth of Puerto Cañon, w. Stanislaus Co., *Hoover* 2856; Corral Hollow, w. San Joaquin Co., *Hoover* 1745. East side of the Sierra Nevada: Bradbury Well, s. end of Black Mts., *C. L. Hitchcock* 12,359; Hanaupah Cañon, Panamint Range, *Jepson* 7029; pass between Coso Mts. and Inyo Mts., *Jepson* 19,536; Grapevine Cañon, Grapevine Mts., *C. N. Smith* 111; Independence (w.), *S. W. Austin* 424; Watterson Mdw., Mono Co., *Renner* 7; Red Rock, Lassen Co., *Blankinship;* Likely, Modoc Co., *C. C. Bruce* 2328. Ore.: Lexington, Morrow Co., *Leiberg* 15. Wash.: Priest Rapids, *Geo. N. Jones* 6369.

Var. **cana** (Jones) Jepson comb. n. Plants 2½ to 8 inches high, the stem stout, solitary but often branched low, glandular-puberulent; leaves ½ to 1½ inches long, typically very white-woolly, the blades pinnately divided into ovatish lobes, the lobes crenate, cuspidate; panicle small; corolla 6 to 9 (or 12) lines long, the limb and slender tube probably blue and throat yellow.—East slope of the Sierra Nevada, 7000 to 10,000 feet: Inyo Co. (Nine-mile Cañon, *C. N. Smith* 158; Cottonwood Creek, *Jepson* 928; near Lone Pine, *Jones;* Guadalupe Cañon, *S. W. Austin* 453); Alpine Co. (Ebbett Pass, acc. *Eastwood*). This variety is, perhaps, no more than a densely woolly form of var. latiflora, but it has a definitely exclusive and highly localized distribution.

Var. **latiflora** Gray. Plants 4 to 14 inches high, usually bushy or diffuse and usually of shorter stature than the species, the stems glandular-pubescent or puberulent or glabrous, paniculately branched above, usually very floriferous but the flowers borne singly (not condensed in close clusters or less commonly); leaves tomentulose or glabrate; calyx glandular-pubescent or glabrous, 1 line long; corolla blue, purple or lavender or pink, 4 to 6 or 7 lines long, its tube little exceeding the calyx or often varying to 3 times as long, gradually passing into the usually narrow throat, the limb 2 to 5 lines wide; corolla-throat white, often with yellow zone; corolla-limb 3 to 4 lines wide.—Plains and mesas, 2000 to 6000 feet: Inyo Co.; Tulare and Kern Cos. in the Sierra Nevada; Mohave Desert; Colorado Desert. Apr.

Locs.—Inyo Co.: Grapevine Mts., *Jepson* 19,823; Towne Pass, Panamint Range, *C. N. Smith* 128; Hanaupah Cañon, Panamint Range, *Jepson* 7091; Darwin Wash, *Renner* 26; Johnson Cañon, Panamint Range, *Jepson* 19,629; Nine-mile Cañon, w. Inyo Co., *C. N. Smith* 159; Alabama Hills, *Renner* 46. Tulare and Kern Cos.: Portuguese Mdw., 3 mi. e. of Peel Peak, *C. N. Smith* 15; Walker Pass, *Jepson* 19,877; Kelso Valley, *C. N. Smith* 179. Mohave Desert: Granite Mts. (s. of Avawatz Mts.), *Jepson* 17,308; Cedar Cañon, Mid Hills, Providence Mts., *Jepson* 18,330; Old Dad Mts., *Jepson* 20,423 (intergrade to var. sinuata); Kelso Mts., *Jepson* 20,578; Ord Mt., *Jepson* 5875; Barstow, *Jepson* 17,204; Cajon Pass, *Jepson* 17,167; Kramer, *Mary Beal* 394; Mohave sta.

(2 mi. n.), *Jepson* 18,384. Colorado Desert: Cottonwood Spr., Eagle Mts., *Jepson* 12,600; Indian Cañon, Collins Valley, ne. San Diego Co., *Jepson* 8841. The foregoing variety passes by intergrades into the:

Var. **speciosa** Jepson var. n. Similar to var. latiflora; flowers mostly in rather close clusters; corolla-tube 5 to 11 lines long (4 to 8 times as long as calyx), the limb (4 or) 5 to 8 lines wide.—(Var. latiflorae similis; flores glomerati, plerumque subdensi; corollae tubus 5–11 lin. longus, calyce 4–8-plo longior; corollae limbus 4–8 lin. latus.)—Eastern Mohave Desert: Granite Mts. (near Avawatz Mts.), *Jepson* 17,295; Garlic Spr. (4½ mi. sw.), near Tiefort Mt., *Jepson* 20,338; Red Rock Cañon, w. end El Paso Mts., *Allison Krames* (type); Paradise Spr. (mesa near), Paradise Mts., *Jepson* 17,311; Calico Mts., *Mary Beal;* Ord Mt., *Mary Beal* 114.

Var. **davyi** Mason. Stems 1 or several from the base, 8 to 13 inches high, glabrous but often glandular-puberulent above, or sometimes nearly throughout; basal leaves 1 to 3 inches long, puberulent, tomentulose or glabrous, the blades pinnately parted, the segments short (2 to 3 lines long), toothed or cleft; cauline leaves few, scattered and reduced or bract-like; flowers clustered at the ends of the branches, the clusters usually rather compact; calyces and pedicels glandular-pubescent; calyx 2 lines long; corolla 9 to 11 lines long, blue, purple or lavender, the tube equaling calyx to 2 times as long, abruptly expanded into the throat, the throat very wide; corolla-limb 6 to 9 lines wide; corolla-throat usually with 5 yellow spots in lower part opposite the lobes, with 5 purple spots below them in mouth of tube, or sometimes the throat merely pale or whitish.—Sandy flats and plains, 2100 to 3200 feet: Mohave Desert; southern Inyo Co. Apr. The flowers are sometimes fragrant.

Locs.—Mohave Desert: Palmdale, *Hoffmann;* Big Rock Creek, San Gabriel Mts., *Craig* 1043; Leona School, Leonis Valley, n. Los Angeles Co., *Jepson* 19,227; Lancaster, *Jepson* 17,047; Amargo, *Jepson* 15,591; Kramer, *Jepson* 17,328; Hicks sta., *Newlon* 493; Hinkley, *Mary Beal;* Rabbit Sprs., *Jepson* 5943; Barstow, *Jepson* 6620; Daggett, *Mary Beal;* Calico Wash, near Calico Mts., *Jepson* 20,324; Kelso Sand Dunes, *Jepson* 20,549. Inyo Co.: Slate Range, *Allison Krames;* pass between Coso Range and Inyo Range, *Jepson* 19,537 (intergrade to G. tenuiflora var. latiflora Gray).

Refs.—GILIA TENUIFLORA Benth., Bot. Reg. sub t. 1622 (1833), type from Cal. (probably Monterey Co.), *Douglas* (typ. vidi); Bot. Reg. t. 1888 (1836). *G. splendens* Dougl.; Paxton, Mag. Bot. 3:260 (1837), type from Cal., *Douglas*. *G. latiflora* Jepson, Fl. W. Mid. Cal. 426 (1901), ed. 2, 331 (1911) in part. *G. tenuiflora* subsp. *eu-tenuiflora* Brand; Engler, Pflzr. 4^{250}:102 (1907). *G. tenuiflora* var. *genuina* Brand, l.c. 102. *G. inconspicua* var. *milesii* Brand, l.c. 105, type loc. San Luis Obispo Co., *Miles*. *G. arenaria* var. *aliciae* Brand, l.c. 103, type loc. Santa Lucia Mts., *Eastwood* 12, perhaps belongs here. *G. hoffmannii* Eastw., Lflts. W. Bot. 2:283 (1940), type loc. Santa Rosa Isl., *Hoffmann* (typ. vidi). Var. ARENARIA Jepson. *G. arenaria* Benth. l.c., type from Cal., *Douglas,* probably in the sand dunes of Monterey Bay, since it has not been collected elsewhere. *G. arenaria* var. *eu-arenaria* Brand, Pflzr. 4^{250}:103 (1907). Var. EXILIS Jepson. *G. latiflora* var. *exilis* Gray, Syn. Fl. ed. 2, 2:411 (1886), "S. Cal. and e. to Nev." (typ. vidi). *G. arenaria* subsp. *exilis* Brand; Engler, Pflzr. 4^{250}:104 (1907). *G. exilis* Abrams, Fl. L. Ang. 289 (1917). *G. latiflora* Jepson, Fl. W. Mid. Cal. 426 (1901), ed. 2, 331 (1911), Man. 798 (1925) in part. *G. leptantha* Parish, Zoe 5:74 (1900), type loc. Seven Oaks, San Bernardino Mts., *Grout*. *G. arenaria* subsp. *leptantha* Brand, l.c. 103. *G. inconspicua* var. *oreophila* Brand, l.c. 105, as to Cal. plant cited. *G. inconspicua* var. *variegata* Brand, l.c. 105, type loc. Mt. Piños, Ventura Co., *Grinnell* 8. *G. inconspicua* var. *diegensis* Munz, Man. 599 (1935), Laguna Mts., *Munz* 9694. Var. GRINNELLII Jepson. *G. grinnellii* Brand, l.c. 101, type loc. Mt. Wilson, San Gabriel Mts., *Grinnell*. *G. collina* var. *grantii* Brand, l.c. 101, type loc. Mt. Wilson, San Gabriel Mts., *Grant* 503. Var. ALTISSIMA Parish, Erythea 6:90 (1898), type loc. Cañon Diablo, foothills near San Bernardino, *Parish* 1592. *G. tenuiflora* var. *genuina* subvar. *altissima* Brand, l.c. 102. *G. tenuiflora* var. *triceps* Brand; Engler, Pflzr. 4^{250}:102 (1907), type loc. near San Bernardino, *Parish* 1592; as to the type only which is same collection number as the type of var. altissima Parish. Var. CARUIFOLIA Munz, Man. 394 (1935). *G. caruifolia* Abrams, Bull. Torr. Club 32:540 (1905), type loc. Cuyamaca Mts., between Cuyamaca Lake and Oriflamme Cañon, *Abrams* 3940. *G. arenaria* var. *caruifolia* Brand; Engler, Pflzr. 4^{250}:104 (1907). *G. latiflora* var. *caruifolia* Jepson, Man. 798 (1925). Var. NEWLONIANA Jepson; type loc. San Andreas Cañon, San Jacinto Mts., *Newlon* 433. Var. SINUATA Jepson. *G. sinuata* Dougl., Benth. in DC., Prodr. 9:313 (1845), type loc. near Oakanagon on the Columbia River, *Douglas* (typ. vidi); (Asa Gray has pencilled on the type sheet at Kew, "longer and shorter corollas on the same plant"). *G. inconspicua* subsp. *sinuata* Brand; Engler, Pflzr. 4^{250}:105 (1907). *G. inconspicua* Dougl.; Hook., Bot. Mag. t. 2883 (1829), "sandy barren on the southern branches of the river Columbia on the northwest coast of America, growing under the shade of Purshia tridentata and some species of Artemisia," *Douglas;* not Gilia inconspicua Sweet (1827). *G. inconspicua* subsp. *euinconspicua* Brand, l.c. *G. latiflora* Jepson, Man. 798 (1925) in part. *G. modocensis* Eastw., Lflts. W. Bot. 2:283 (1940), type loc. betw. Likely and Jess Valley, Modoc Co., *Eastwood & Howell* 8073 (typ. vidi). Var. CANA Jepson, Man. 798 (1925). *G. latiflora* var. *cana* Jones, Contrib. W. Bot. 8:35 (1898), type loc. Lone Pine, Inyo Co., *Jones*. *G. cana* Hel., Muhl. 2:266 (1907). *G. tenuiflora* subsp. *cana* Brand, Ann. Conserv. et Jard. Bot. Genève 15 & 16:330 (1913). *G. collina* var. *coronata* Brand; Engler, Pflzr. 4^{250}:101 (1907), type loc. Guadalupe Cañon, Inyo Co., *S. W. Austin* 453. *G. tenuiflora* var. *triceps* subvar. *speciosissima* Brand, l.c. 102, type loc. Olancha, Inyo Co., *T. Brandegee*. *G. alpina* Eastw., Lflts. W. Bot. 2:282 (1940), type loc. Carson Pass, *Eastwood & Howell* 8414 (typ. vidi). Var. LATIFLORA Gray, Proc. Am. Acad. 8:278 (1870), "Los Angeles County ? *Fremont, Wallace*" (typ. vidi); (first collected by Fremont, undoubtedly in the Mohave Desert, although there was no "Los Angeles County" at the time of Fremont's 1844 expedition through the Mohave Desert; the collection of Wallace, of later years, must have been made on the desert side of Los Angeles Co.); Jepson, Man. 798 (1925) in part. *G. latiflora* Gray, Syn. Fl. 2:147 (1878). *G. tenuiflora* subsp. *latiflora* Brand; Engler, Pflzr. 4^{250}:102 (1907). *G. tenuiflora* var. *purpusii* Mlkn., Univ. Cal. Publ. Bot. 2:29 (1904), type loc. Hockett Mdws. (mountain near), *Purpus;* Jepson, Man. 798 (1925). *G. collina* Eastw., Bot. Gaz. 37:445 (1904), type loc. a mountain near Hockett Mdws., Tulare Co., *Purpus* 1783. *G. collina* var. *typica* Brand; Engler, Pflzr. 4^{250}:101 (1907). *G. stellata* Hel., Muhl. 2:117 (1906), type loc. Randsburg, Kern Co., *Heller* 7698. Var. SPECIOSA Jepson; type loc., Red Rock Cañon, w. end El Paso Mts., *Krames*. Var. DAVYI Mason; Jepson, Man. 597 (1925). *Gilia davyi* Mlkn., Univ. Cal. Publ. Bot. 2:30 (1904), type loc. Tehachapi (not "Antelope Valley"), *Davy* 2178. *G. arenaria* var. *davyi* Brand, l.c. 104. *G. tenuiflora* var. *excellens* Brand, l.c. 103, "near Cameron" (that is, on the desert side of the lower Tehachapi Pass), Kern Co., *K. Brandegee*.

6. **G. ochroleuca** Jones. Stems slender, one to several from the base, branched, erect or ascending, 4 to 9 inches high, glandular-puberulent or glabrous; leaves villous or tomentulose to glabrate, disposed in a basal tuft but also cauline and reduced upwards; flowering branches and calyces with scattered tack-shaped glands; basal leaves petioled, ¼ to 1½ inches long, pinnately divided into 5 to 9 lobes, the lobes linear, entire or sometimes toothed; cauline leaves palmately divided into 5 (or 3) lobes or sometimes pinnately 5-divided, sessile, mostly 3 to 9 lines long; flowers on slender spreading or divaricate pedicels in loose open cymes; calyx about 1 line long, its triangular-acute teeth ⅕ to ¼ as long as the tube; corolla yellow, sometimes white, rarely purplish-tinged, slender-funnelform, 2 to 4 lines long, 2 to 3 times as long as the calyx, its tube shorter than the calyx to twice as long; stamens included in corolla-throat; capsule ovate, its cells several-seeded; seeds showing spiricles when wetted.

Desert slopes and mesas, 2000 to 5000 (or 6800) feet: Mt. Piños region; Mohave Desert; southern Sierra Nevada in Kern Co.; Inyo Co.; Mono Co. East and north to Nevada. Feb.-June.

Locs.—Mt. Piños region: Frazier Mt., *Hoffman*. Mohave Desert: Rabbit Sprs., *Parish* 9808; Box S ranch (20 mi. n.), *Munz* 12,418; Kramer, *K. Brandegee;* Providence Mts., *Jepson* 18,210 (Fountain Cañon), 18,285 (Bonanza King Cañon), 18,332 (Cedar Cañon, Mid-Hills); Barnwell, New York Mts., *K. Brandegee*. Southern Sierra Nevada: Erskine Creek, *Purpus* 5524. Inyo Co.: Darwin Valley, *Hall & Chandler* 7103; Independence, *S. W. Austin* 423; Red Hill, w. of Bishop, *Heller* 8429. Mono Co.: Rock Creek, *Peirson* in litt.

Refs.—GILIA OCHROLEUCA Jones, Contrib. W. Bot. 8:35 (1898), type loc. Darwin Mesa, Argus Mts., *Jones;* Jepson, Man. 797 (1925). *G. inconspicua* var. *ochroleuca* Brand; Engler, Pflzr. 4^{250}:105 (1907).

7. **G. scopulorum** Jones. Stem branching from or near the base, 4 to 12 inches high, the branches slender; herbage clammy glandular-pubescent or the inflorescence nearly glabrous; leaves mostly in a basal tuft, the cauline few, the upper reduced to few-lobed or entire bracts; blades of basal leaves 1 to 1¾ inches long, pinnately divided (with pinnatifid lobes), or pinnatifid or sometimes merely incisely or coarsely toothed, petioled; cauline leaves similar to the basal, sessile; flowers loosely cymose-paniculate; calyx ⅔ to 2 lines long, cleft ⅓ to ½; corolla tubular-funnelform, livid red, pink, lavender or white with yellow throat, 4 to 6 lines long, the slender tube 1½ to 3 times as long as the calyx, the lobes apiculate; stamens with very short filaments inserted in sinuses.

Desert flats and cañons, 500 to 4000 feet: eastern Mohave Desert and north to Mono Co. East to Utah. Apr.-May.

Locs.—Mohave Desert: Copper Basin Creek, Whipple Mts., *Peirson* 11,484; Needles, *Jones* 3846; Kelso, *Jones;* Red Rock Cañon, w. end El Paso Mts., se. Kern Co., *Munz* 12,447. Inyo Co.: Johnson Cañon, Panamint Range, *Jepson* 19,779; Nelson Range, *S. W. Austin;* Keeler, *T. Brandegee*. Mono Co.: Mono Lake, *Ottley* 1109.

Refs.—Gilia scopulorum Jones, Bull. Torr. Club, 8:70 (1881), type loc. St. George, Utah, *Jones*. *G. scopulorum* var. *covillei* Brand; Engler, Pflzr. 4^{250}:109 (1907), type loc. Funeral Mts., Inyo Co., *Coville* 450. *G. tenuiflora* var. *triceps* Brand, l.c. 102, as to *Coville* 620, the second cited collection.

8. **G. capitata** Dougl. Globe Gilia. (Fig. 382.) Stem simple or commonly strictly branched above, slender, ⅔ to 3 feet high, the leaves both basal and cauline, the cauline gradually reduced upwards; herbage glabrous to puberulent, sometimes minutely glandular; leaf-blades 1 to 4 inches long, pinnate to bipinnate with linear lobes 1 line to 1½ inches long, petioled, the petioles 2 to 12 lines long; flowers in terminal usually spherical heads, the heads dense, 5 to 8 (or 11) lines broad, borne on long (2 to 13 inches) naked peduncles; calyx glabrous to thinly woolly, typically turbinate, cleft half-way, ruptured in fruit, its lobes lanceolate; corolla funnelform, white to blue, purple or lavender (but, whatever the color, usually pale), 3 to 4 lines long, its lobes linear; stamens exserted, the filaments inserted in the corolla-sinuses, the anthers blue; capsule ovate, several-seeded; seeds showing spiricles when wetted.

Open slopes and sandy or loamy flats, 50 to 5000 (or 8000) feet: North Coast Ranges from Marin and Solano Cos. to Siskiyou Co.; Sierra Nevada from Mariposa Co. to Shasta Co. North to Washington. Apr.-Aug.

Locs.—North Coast Ranges: Mt. Tamalpais, *Jepson*; Bodega, Sonoma Co., *Chandler* 696; Santa Rosa, *M. S. Baker* 593; Howell Mt., Napa Range, *Jepson* 15,073; Collins Camp, Vaca Mts., *Jepson* 15,078; Bartlett Mt., n. Lake Co., *Jepson* 18,925; Yorkville, s. Mendocino Co., *W. I. Follett* 89; South Mill Creek, se. of Ukiah, *Jepson* 3009; Fort Bragg, *Mathews* 70; Round Valley, ne. Mendocino Co., *Goddard* 618; Alder Sprs., w. Glenn Co., *Heller* 11,453; Paskenta, sw. Tehama Co., *Virginia Bailey*; Look Prairie, Bull Creek, Humboldt Co., *Constance* 621; Rosewood, w. Tehama Co., *Jepson* 15,075; French Camp Ridge, Humboldt Co., *Tracy* 13,995; Trinity Summit, *Tracy* 14,345; Cedar Creek Flat, Del Norte Co., *R. Van Deventer* 234; Marble Mt., w. Siskiyou Co., *Jepson* 2832; Yreka, *Butler* 741. Sierra Nevada: Yosemite, *Jepson* 15,079; Kennedy Mdw., e. Tuolumne Co., *A. L. Grant* 217; Rich Gulch, Plumas Co., *W. I. Follett* 79; Colby, Butte Co., *R. M. Austin* 833; Goose Valley, Shasta Co., *Baker & Nutting*.

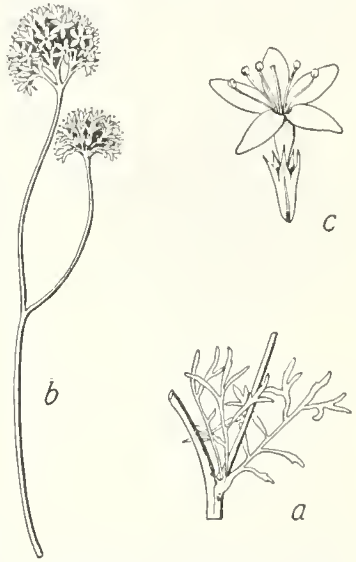

Fig. 382. Gilia capitata Dougl. *a*, cauline leaf, × ½; *b*, infl., × ½; *c*, fl., × 3. Drawn from *Douglas* type, Royal Botanic Gardens, Kew, (Herb. Benth.).

Refs.—Gilia capitata Dougl.; Hook., Bot. Mag. t. 2698 (1826), type loc. Ft. Vancouver, Wash., *Douglas*; Jepson, Fl. W. Mid. Cal. 426 (1901), ed. 2, 331 (1911), Man. 795 (1925). *G. pallida* Hel., Muhl. 1:43 (1901), type loc. Petrified Forest, Sonoma Co., *Heller* 5739. *G. glandulifera* Hel., Muhl. 2:114 (1906), type loc. Redding, Shasta Co., *Heller* 7868 (isotyp. vidi). *G. capitata* var. *glandulifera* Brand, Ann. Conserv. et Jard. Bot. Genève 15 & 16:331 (1913). *G. tenuisecta* Hel., l.c. 2:115, type loc. Redding (3 mi. ne.), Shasta Co., *Heller* 7898. *G. capitata* var. *trisperma* T. Bdg.; Brand in Engler, Pflzr. 4^{250}:112 (1907), type loc. Trinity Co., *Eastwood*.

9. **G. staminea** Greene. (Fig. 383.) Range Gilia. Stems erect, branching, ½ to 2¼ feet high, puberulent and often minutely glandular or glabrate, the petioles often villous-arachnoid, the blades glabrous; leaf-blades ½ to 3½ inches long, pinnately or mostly bipinnately divided into linear lobes 2 to 8 lines long; petioles very short to as long as the blade; heads densely globose or somewhat 2 or 3-lobed, commonly ¾ to 1½ inches broad (commonly larger than in G. capitata); calyx densely woolly, sometimes glabrate, its tube with broad membranous intervals between the ribs, its lobes broadly membranous-winged and in this way ovate and abruptly acuminate-cuspidate, ½ to as long as the tube; corolla blue or whitish,

funnelform, 4 to 5 lines long, its lobes ovate to oblong; stamens a little exserted from corolla-throat.

Open hillslopes and valleys, 25 to 2500 (or 7700) feet: Sierra Nevada from Plumas Co. to Kern Co.; Great Valley; Tehachapi Mts.; South Coast Ranges from Contra Costa Co. to San Luis Obispo Co.; western Mohave Desert; cismontane Southern California. South to Lower California. Apr.-May.

Tax. note.—As here formally set down, the ranges of Gilia staminea and Gilia capitata are indicated as if mutually exclusive, a situation not wholly true, but true to a significant degree. There is some slight or occasional overlapping, and intermediate individuals are also found. In the central and southern Sierra Nevada many collections occur which, though in the main referred to Gilia staminea, often verge towards Gilia capitata. In the South Coast Range territory of Gilia staminea, infrequent colonies appear which approach Gilia capitata closely. Considering the entire range of either species, such intermediates are, however, relatively few; typical individuals of either species occur only within the main range of its species. Exceptions are few: for example, *Jepson* 15,080, which is typical Gilia staminea, is found in Weldon Cañon, Vaca Mts., that is, in the North Coast Range territory of Gilia capitata.

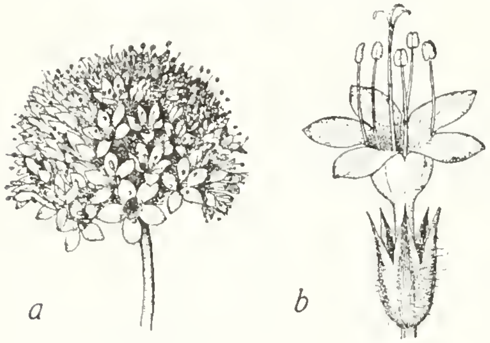

Fig. 383. GILIA STAMINEA Greene. *a*, infl., × 1; *b*, fl., × 3.

The flower heads in Gilia staminea are usually larger than in Gilia capitata. They are sometimes quite spherical but frequently loose and irregular and (as it were) 2 or 3-lobed. Sometimes the heads of Gilia staminea, in association with free branching, break up into numerous very small or few-flowered heads. While not invariable, the breadth of the corolla-lobes is the most satisfactory differentiating character as between these two species. In California Gilia staminea is more widely distributed than Gilia capitata and is distinctly more variable. The following are cited as Gilia staminea.

Locs.—Sierra Nevada: American Valley, Plumas Co., *Lemmon;* Colfax, Placer Co., *Sonne;* Avery sta., Calaveras Co., *A. L. Grant;* Gwin Mine, Calaveras Co., *Jepson* 1759; Columbia, Tuolumne Co., *A. L. Grant* 683; Yosemite, *Jepson* 10,479; Fresno Flats, Madera Co., *Jepson* 12,855; betw. Dunlap and Pinehurst, Fresno Co., *Newlon* 156; Grapevine Spr., Tulare Co., *P. S. Woolsey;* Poso Creek (near Poso Mine), Greenhorn Mts., *C. N. Smith* 276. Tehachapi Mts.: Bear Mt., *Jepson* 7170; Rowen, *Jepson* 6740. Great Valley: Marysville Buttes, *Jepson* 15,077; Sacramento; Antioch, *Davy* 892; French Camp, San Joaquin Co., *Sanford;* Modesto, *Hoover* 581; Livingston (5 mi. sw.), Merced Co., *Jepson* 12,754; Orosi, Tulare Co., *H. P. Kelley;* Bakersfield, *Davy* 1886. Vaca Mts.: Weldon Cañon, *Jepson* 15,080. South Coast Ranges: San Francisco, *Blasdale;* Nortonville, Contra Costa Co., *Jepson* 15,723; Corral Hollow, w. San Joaquin Co., *Jepson* 9582; Cupertino, Santa Clara Valley, *Pendleton* 790; Jamesburg, Monterey Co., *R. M. Holman;* Estrella, San Luis Obispo Co., *Jared.* Western Mohave Desert: Manzana, *Davy* 2546; Llano Verde, West Palmdale, *Davy* 2307. Cismontane S. Cal.: Salisbury Potrero, Santa Barbara Co., *H. & M. Dearing* 1411; Santa Barbara, *Lemmon;* Mandeville Cañon, Santa Monica Mts., *Clokey & Templeton* 4476; Rubio Cañon, San Gabriel Mts., *Peirson* 154; Pacoima Cañon, San Gabriel Mts., *Peirson* 384; San Bernardino foothills, *Parish;* Saunders Mdw., San Jacinto Mts., *C. V. Meyer;* Cootea, Palomar Mt., *Jepson* 1515; Mesa Grande, San Diego Co., *E. Ferguson* 34.

Refs.—GILIA STAMINEA Greene, Erythea 3:105 (1895), "very common throughout the interior of Cal." *G. capitata* var. *staminea* Brand; Engler, Pflzr. 4^{250}:111 (1907). *G. achilleaefolia* Gray, Syn. Fl. 2:147 (1878), mainly; Jepson, Fl. W. Mid. Cal. 426 (1901), ed. 2, 331 (1911); not Benth. *G. capitata* var. *achilleaefolia* Mason; Jepson, Man. 795, fig. 772 (1925).

10. **G. chamissonis** Greene. DUNE GILIA. Stems 10 to 20 inches high, robust, divaricately branched or simple, arising from a basal or sub-basal dense tuft of leaves; herbage conspicuously glandular; leaves 1 to 3½ inches long, bipinnate, the narrowly linear or filiform divisions spreading or curving; flowers densely capitate, the heads spherical, ¾ to 1¾ inches broad; pedicels densely long-woolly, the calyces less so; calyx inflated, somewhat accrescent and therefore not usually ruptured in fruit, the hyaline intervals very full; corolla deep blue, funnelform, 4 to 5 (or 7) lines long, 4 to 5 lines wide; stamens conspicuously exserted, the filaments inserted in the corolla-sinuses; anthers pale blue.

Sand dunes and beaches along the coast line, 5 to 50 feet: Humboldt Co. to San Francisco Bay and south to Santa Barbara Co.; also on an arm of Suisun Bay in the lower San Joaquin Valley. May-June.

Locs.—Betw. Trinidad and Little River, Humboldt Co., *Tracy* 2583; Alton, Humboldt Co., *Tracy* 3672; Bodega Pt., Sonoma Co., *Cooper* 88; Bolinas Bay, *K. Brandegee;* Antioch (relict sand dune in interior but situated on an arm of Suisun Bay), *Swenson;* Presidio, San Francisco, *Jepson* 15,081; Lake Merced, San Francisco, *K. Brandegee;* Antonio siding betw. Casmalia and Surf, Santa Barbara Co., *K. Brandegee.*

Geog. note.—In its best developed or most typical form, perhaps always, Gilia chamissonis is an inhabitant of pure sand on ocean dunes. This fact, in connection with its morphological characters, furnishes the basis for its recognition as a species. It does, however, in reality or in appearance intergrade to Gilia staminea in the South Coast Ranges, while northern plants of it simulate Gilia capitata in certain particulars. Such evidence tends to argue that it should be disposed as a variety of Gilia staminea or Gilia capitata. If the principle of even moderate intergradation be enforced too strongly against specific validity, the fall of Gilia chamissonis would also drag down Gilia capitata, G. staminea, G. achilleaefolia, G. multicaulis and various other species in this genus. While Gilia chamissonis is, admittedly, kept as a species with considerable diffidence, it is retained, partly by reason of its geographic consistency.

Var. **regina** Jepson comb. n. Stem once or twice forked, arising from a conspicuous basal tuft of leaves; leaf-segments broader, the rachis somewhat woolly; peduncles long, stout and naked; heads large (1 to 1¾ inches wide); corolla large (4½ to 5 lines long, 3 to 6 lines wide); anthers large.—Sand dunes, Point Reyes peninsula, Marin coast (*L. Tinsley*).

Refs.—GILIA CHAMISSONIS Greene, Erythea 3: 105 (1895), type loc. "sand-hills of San Francisco," *Greene*, based on the same characteristic plant of the San Francisco sandhills as Polemonium capitatum Esch., Mem. Acad. Petrop. 10:282 (1826), "in Novae Californiae arenosis" [San Francisco], *Eschscholtz;* not Gilia capitata Dougl. (1826). *G. achilleaefolia* subsp. *chamissonis* Brand; Engler, Pflzr. 4^{250}:111 (1907), in part. *G. achilleaefolia* var. *chamissonis* Nels. & Mcbr., Bot. Gaz. 61:34 (1916). *G. achilleaefolia* var. *tomentosa* Eastw.; Brand in Engler, Pflzr. 4^{250}:111 (1907), type loc. Bodega Pt., Sonoma Co., *Eastwood* 2. Var. REGINA Jepson. *G. capitata* var. *regina* Jepson, Man. 795 (1925), type loc. Pt. Reyes peninsula, *Jepson* 8315.

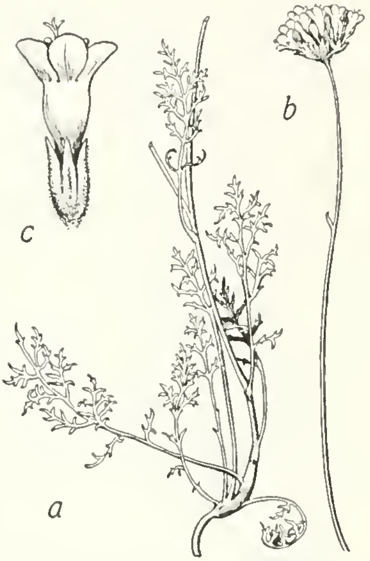

Fig. 384. GILIA ACHILLEAEFOLIA Benth. *a*, lower part of plant, × ½; *b*, infl., × ½; *c*, fl., × 2½. Drawn from *Douglas* type, Royal Botanic Gardens, Kew (Herb. Benth.).

11. **G. achilleaefolia** Benth. (Fig. 384.) Stem erect, erectly branching or simple, 7 to 17 inches high; herbage glabrous to puberulent; leaves 1 to 5 inches long, the blades pinnately or mostly bipinnately divided into linear segments; flowers about 5 to 15 in rather dense terminal cymes, the cymes capitate but not globose; calyx puberulent, 3 to 3¼ lines long, its triangular-acute or lanceolate teeth ½ as long as the tube; corolla violet-blue or rarely white, broadly funnelform, 5 to 8½ lines long, 2½ to 4 times as long as the calyx; corolla-throat and -limb exceeding (sometimes much exceeding) the corolla-tube, the throat extremely ample and the lobes ovate to oblong; corolla-tube much shorter than, equaling or only slightly exceeding the calyx; stamens included in corolla-throat; style usually exserted.

Rocky foothills and flats, 100 to 1200 feet: mostly along or near the coast line from Santa Clara Co. to Los Angeles Co. Mar.-May.

Tax. note.—The true Gilia achilleaefolia Benth., as here described, appears to be the plant on or near the coast line from middle California to Los Angeles Co., that is, the species described as Gilia abrotanifolia Nutt. by Greene. It is remarkable for its broad or turbinately expanded corolla-throat which usually exceeds the short narrow tube. The inflorescence is a much condensed or capitate cyme with the flowers all erect; the calyces are villous or puberulent; the stamens are included. The species here described as Gilia staminea Greene, that is Gilia achilleaefolia of Gray (Syn. Fl. 2:147,—1876) in great part, Jepson, Fl. W. Mid. Cal. 426 (1901) and many other authors, is a plant which often simulates the true Gilia achilleaefolia in habit and in flowers very closely; its inflorescence is likewise a dense head-like cyme, but its heads, whether symmetrically or irregularly globose, bear the flowers spreading (all around) outwards; the stamens are exserted; the calyces are densely woolly to glabrate; it ranges widely in the interior, although also occurring along the coast. In the mass, the technical differences between the two species are slight in degree and are apparently degraded by intermediates. The decision here made that Gilia abrotanifolia Nutt. equals Gilia achilleaefolia Benth. is based first upon Douglas specimens now in the University of California Herbarium which are presumably part of the original Douglas collection of Gilia achilleaefolia made in California; second, upon the illustration of Gilia achilleaefolia in the Botanical Register (t. 1682); and third, upon a drawing of the type specimen made under the direction of the author in the Herbarium Benthamianum. That the Botanical Register illustration represents the south coast line plant heretofore called Gilia abrotanifolia Nutt. is noted by R. F. Hoover. It is not the more widely dispersed plant hitherto called G. achilleaefolia in American floras which latter is now described as Gilia staminea Greene.

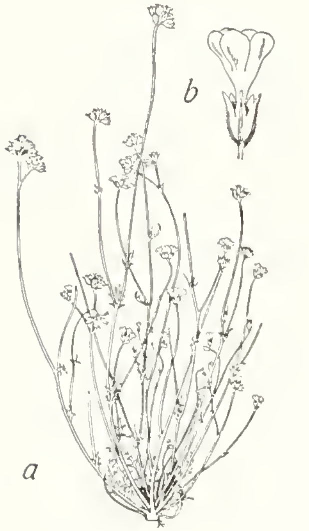

Fig. 385. GILIA MULTICAULIS Benth. *a*, habit × ½; *b*, fl., × 3. Drawn from *Douglas* type, Royal Botanic Gardens, Kew (Herb. Benth.).

Gilia achilleaefolia Benth. is also closely allied to Gilia multicaulis Benth. Both are coastal species, but Gilia multicaulis has a more extensive longitudinal range and extends further to the interior. In the northern and southern parts of its range Gilia achilleaefolia intergrades with Gilia multicaulis, but has its extreme expression in coastal San Luis Obispo County where, apparently, typical Gilia multicaulis is less common.

Collections of Gilia achilleaefolia are cited as follows: Mt. Hamilton Range (w. slope): Alum Rock, *Pendleton* 684; Coyote Cañon (mouth), e. of Madrone, *Hoover* 3268. Santa Cruz Mts.: Stanford (foothills near), *C. F. Baker* 643; Los Gatos (foothills w.), *Heller* 7396. Gabilan Range: San Juan, San Benito Co., *Elmer* 5037. San Luis Obispo Co.: Paso Robles, *Barber;* San Luis Obispo, *M. M. Miles* 134; Arroyo Grande, *Alice King*. Coastal S. Cal.: Gaviota Pass, Santa Barbara Co., *Brewer* 390; Saugus, Los Angeles Co., *Geo. B. Grant* 5433; Claremont, *Chandler*. Desert slope San Bernardino Mts.: headwaters Mohave River, *Palmer* 411.

Refs.—GILIA ACHILLEAEFOLIA Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas;* Lindley, Bot. Reg. t. 1682 (1835); not of Gray, Jepson and other American authors. *G. abrotanifolia* Nutt.; Greene, Erythea 3:104 (1895), type loc. Santa Inez Mts., back of Santa Barbara, *Nuttall;* (since the binomial is Nuttall's, it seems better to designate Nuttall's specimen as the type of Greene's description, although it is not mentioned first by Greene). *G. achilleaefolia* subsp. *abrotanifolia* Brand; Engler, Pflzr. 4^{250}:111 (1907), excluding reference to Mariposa Co. *G. multicaulis* var. *eximia* Mlkn., Univ. Cal. Publ. Bot. 2:35 (1904), type loc. Evergreen, Santa Clara Co., *Davy* 1883. *G. multicaulis* subsp. *eximia* Brand, l.c. 110.

12. **G. multicaulis** Benth. (Fig. 385.) Stem simple to bushy-branching, strict to ascending, 6 to 20 inches high; herbage glabrate or puberulent, the inflorescence puberulent or with short gland-tipped hairs; leaves chiefly basal or sub-basal, slightly reduced up the stem, the blades never glandular or rarely so, pinnate or bipinnately divided, the lobes filiform or linear, remote or crowded, 1½ to 5 (or 7) lines long; lower leaves 1 to 4 inches long, petioled, upper ones sessile; flowers 2 to 7 in terminal glomerules, or sometimes solitary; calyx cleft ⅓, its lobes triangular-lanceolate, cuspidate, the scarious intervals often purple; corolla funnelform, whitish or smoky-blue or pinkish, 3½ to 5 (usually about 4) lines long, about twice as long as calyx, its tube yellowish; stamens shorter than the corolla-lobes, inserted at the sinuses; capsule ovate-oblong, the cells many-seeded; seeds showing spiricles when wetted.

Dry rocky or gravelly hills and flats, 175 to 3000 feet: Marin Co.; South Coast Ranges; cismontane Southern California; west side of the Colorado Desert; south to Lower California. Apr.-June.

Tax. note.—Gilia multicaulis, based on a Douglas plant from California, was, almost without doubt, discovered in the South Coast Ranges. The type (preserved at Kew; see fig. 384) is a plant 8 inches high with several erect stems from the base and the flowers borne in terminal 2 to 7-flowered glomerules. The stems are somewhat leafy and a few pinnately divided leaves are borne at base. The calyx and pedicels are provided with short gland-tipped hairs. The calyx-lobes are about ⅖ as long as the tube. The throat of the funnelform corolla is shorter than the corolla-tube. On the one hand Gilia multicaulis approaches so closely to Gilia achilleaefolia that some collections seem as well referred to one species as to the other. On another hand, through a chain of simulations, it exhibits the habit and the corolla markings of Gilia tricolor. Corollas so marked are, however, quite small and present a sufficient contrast to the ample corollas of Gilia tricolor.

In its prevailing form Gilia multicaulis is a leafy-stemmed plant without marked basal leaf-rosette, its flowers borne in few- to several-flowered glomerules. In its inflorescence it is extremely variable and solitary flowers or loosely flowered forms are frequent. Like most highly plastic Gilia species it has been much subject to specific segregation by some botanists. A few of its extreme phases are described below as subspecies or varieties. The following collections are cited as validating the range of the species:

Locs.—Marin Co.: Mt. Tamalpais, *Jepson* 7556. South Coast Ranges: Berkeley Hills, *Jepson* 15,072; Mt. Diablo (Erythea I:176); Mt. Day, Mt. Hamilton Range, *R. J. Smith;* Ben Lomond, Santa Cruz Mts., *K. Brandegee;* Carmel Mission, *Heller* 6525; Cholame, San Luis Obispo Co., *Wiggins* 5778. Cismontane S. Cal.: Santa Rosa Isl. and Santa Cruz Isl., *T. Brandegee;* Santa Maria (7 mi. se.), *Jepson* 19,098; Tepusquet Cañon, near Sisquoc River, n. Santa Barbara Co., *H. & M. Dearing* 1430; Big Tujunga Cañon, San Gabriel Mts., *Peirson* 157a; Saugus, *Davy;* Eaton Cañon, San Gabriel Mts., *Peirson* 424; Henninger Flat, San Gabriel Mts., *Peirson* 157; San Bernardino, *Parish;* Banning, *Clokey & Templeton* 4661; Anaheim plains, *Alice King;* Riverside, *Jepson* 1230; Elsinore, *Munz* 12,024; Oak Grove, ne. San Diego Co., *Jepson* 17,149; San Pasqual, San Diego Co., *Jepson* 19,176; Viejas Valley, San Diego Co., *Jepson* 11,836; Mesa Grande, San Diego Co., *E. Ferguson* 39; La Junta, near Jamul, San Diego Co., *Newlon* 342. West side Colorado Desert: Andreas Cañon, San Jacinto Mts., *Newlon* 433b.

Var. **clivorum** Jepson var. n. Stem branched or sometimes simple, 4 to 15 inches high; herbage densely glandular to glabrate; leaves 6 to 12 lines long, pinnately or bipinnately divided into very narrow rather remote lobes, the upper leaves sessile, the lower petiolate; flowers in terminal few-flowered glomerules; calyx cylindric, cleft ⅓, the hyaline intervals extremely narrow and typically dark purple; corolla 3 to 4 lines long, 1⅓ to 2 times as long as calyx, dull blue, the throat ornamented with 5 dark purple spots; corolla-lobes narrowly oblong to broadly ovate, little spreading in anthesis; stamens inserted at sinuses, shorter than corolla-lobes; capsule ovate, 2 to 2½ lines long, the cells many-seeded; seeds with a narrow membranous margin.—(Caulis ramosus vel subsimplex, 4–15 unc. altus; herba dense glandulosa vel glabrata; folia 6–12 lin. longa, uni- vel bi-pinnatifida, lobis angustis subremotisque; glomeruli terminales pauciflores; calyx cylindricus, intervallis hyalinis angustissimis atropurpureisque; corolla 3–4 lin. longa, caerulea remissa, calyce 1⅓–2-plo longior, fauce maculis 5 atropurpureis ornata; corollae lobi anguste oblongi vel late ovati; stamina sinibus affixa, corollae lobis breviora; capsulae loculi polyspermi; semina anguste membranacea alata.)—Gravelly hillslopes or cañon sides, 20 to 1200 feet: South Coast Ranges from Contra Costa and San Mateo Cos. to San Luis Obispo Co.; northwestern Santa Barbara Co. Mar.-May. Here are included plants of the South Coast Range hills back of the coast line which previously have been named Gilia millefoliata or Gilia multicaulis var. millefoliata. The true Gilia millefoliata F. & M. is, however, a plant of the coast line sand dunes from Sonoma Co. to Del Norte Co., which is here referred to Gilia inconspicua Sweet and is held different from Gilia multicaulis var. clivorum of the South Coast Range hills. Var. clivorum is a slender plant with smaller corollas; its calyx is not very markedly accrescent; its capsules are oblong-ovate and 2 lines long. The stems of Gilia inconspicua by contrast are a little stoutish and rigid; the calyx is strikingly accrescent; the oblong capsules are 3 to 4 lines long. There is also marked geographic segregation. The following are citations of var. clivorum:

Locs.—Mitchell Cañon, Mt. Diablo, *C. F. Baker* 2951; Crystal Springs Lake, San Mateo Co., *C. F. Baker* 467; San Martin, Santa Clara Co., *Chandler* 897; Hayes sta., s. end Panoche Hills, w. Fresno Co., *Jepson* 16,980; Paso Robles, *Barber* (type); San Luis Mt., *Summers.* Santa Barbara Co.: San Miguelito Cañon, Lompoc, *Munz* 10,249.

Var. **millefolia** Gray. Stem leafy; leaves ½ to 1½ inches long, thrice pinnate with numerous short linear or subfiliform segments, the segments crowded, ¼ to 1½ lines long; calyx-teeth spreading; corolla bluish, very narrowly funnelform, its tube more slender, the throat scarcely expanded, 3½ to 4 lines long; capsule long-oblong.—Santa Barbara Isls.: Santa Cruz Isl., *T. Brandegee;* Green Cañon, Santa Rosa Isl., *Hoffmann;* San Clemente Isl., *Munz* 6633. South to Guadalupe Isl., *Anthony* 235.

Var. **peduncularis** (Eastw.) Jepson comb. n. Stem slender, erect and sparsely branched, 8 to 16 inches high, sometimes diffusely branched from the base; herbage subglabrous or thinly and finely villous, the peduncles or pedicels minutely glandular-puberulent; leaves ½ to 2¼ inches long, the blades pinnately divided into 3 to 7 (or 9) somewhat remote segments, the segments linear or narrow-oblanceolate, 2 to 7 lines long, entire (or rarely with 1 prominent lobe); flowers solitary on filiform naked pedicels ½ to 2 inches long, or sometimes some of the flowers in clusters of 2 or 3 on very short pedicels and the clusters on long naked peduncles; calyx puberulent, ½ to ¾ as long as the corolla, its lanceolate teeth about equaling the calyx-tube; corolla blue or whitish, tubular-funnelform, 3 to 5 lines long, its tube included in the calyx-tube or barely exserted.—Hillslopes, 500 to 2100 feet: Vaca Mts.; South Coast Ranges from Contra Costa Co. to San Luis Obispo Co. and western Fresno Co.; Greenhorn Mts., Kern Co.; coastal Southern California (rare); northwestern Colorado Desert. South to Lower California. Apr.

Geog. note.—Gilia multicaulis var. peduncularis seems little more than a loose form of Gilia multicaulis but is here given varietal status because of the characters developed in its extreme phase: the slender habit, the few long remote segments of the pinnately divided leaves, the long naked filiform pedicels, the frequently solitary flowers and the small corollas. This varietal group, however, as here defined, does not seem to represent a natural entity of a single genetic origin since it occurs sporadically throughout the range of the species. The case against recognition of Gilia peduncularis as a species may be stated thus: Its aspect indicates it as a merely tenuous form of Gilia multicaulis. Typically the stems are remotely leafy and the basal cluster of leaves weak, but when the basal leaf-cluster is strongly developed, the cauline leaves are often much reduced and the plant tends again to suggest the species. Although the flowers are solitary in the type of Gilia peduncularis, collections often show flowers in glomerules (as in Gilia multicaulis) as well as solitary. A plant with pedicelled flowers may often be found in a collection consisting of plants displaying quite glomerate flowers (that is, with 4, 5 or 6 flowers in a cluster), or often several of the flowers of a glomerate plant are solitary. Furthermore, those plants whose flowers are solitary rather than glomerate, or wholly solitary, differ so greatly among themselves that it seems unnatural to segregate them as a species or perhaps even as a variety. Nor are they segregated geographically from Gilia multicaulis, since they occur, rather, throughout the geographic area of Gilia multicaulis. To give these long-pedicelled plants specific rank would do violence to the plant population of Gilia multicaulis, as a whole, as found in its natural range. To the foregoing the following note may be added. "In Gilia tricolor two forms likewise occur, the typical form in which the flowers are congested and var. longipedicellata with a loose inflorescence. To all appearances var. peduncularis bears the same relation to Gilia multicaulis as does var. longipedicellata to Gilia tricolor."—R. F. Hoover.

Locs.—Vaca Mts.: Dutton Cañon, *Jepson* 15,068; Graveyard Hill, se. of Vacaville, *Jepson* 15,071 (grading towards var. clivorum). South Coast Ranges: Mt. Diablo, *Bowerman* 2839; Kings Mt., San Mateo Co., *Keck* 2931; Mt. Hamilton Range (foothills e. of Gilroy), *Hoover* 3272; Charmichael Mill, Santa Cruz Mts., *Pendleton* 935; Sur River, Monterey Coast, *Eastwood;* Tassajara Hot Sprs., Santa Lucia Mts., *Ferris* 8320; Zapato Cañon, Diablo Range, sw. Fresno Co., *Jepson* 15,376 (flowers sometimes in compact clusters, thus approaching typical Gilia multicaulis). Greenhorn Mts., Kern Co.: Poso Mine (3 mi. sw.), Poso Creek, *C. N. Smith* 50; Kern River Park, *Krames.* Coastal S. Cal.: Zaca road, Santa Ynez Valley, *Hoffmann;* Refugio Pass, Santa Ynez Mts., *Hoffmann;* Prisoners Harbor, Santa Cruz Isl., *Hoffmann* 794; Ramona, San Diego Co., *K. Brandegee.* Northwestern Colorado Desert: Andreas Cañon, San Jacinto Mts., *Newlon* 432 (grading towards the species).

Refs.—GILIA MULTICAULIS Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas* (typ. vidi); Jepson, Fl. W. Mid. Cal. 425 (1901), ed. 2, 331 (1911), Man. 796 (1925). *G. multicaulis* var. *tenera* Gray, Proc. Am. Acad. 8:278 (1870), type from "Cal."; very slender, peduncles long, the terminal clusters usually 2 or 3-flowered or reduced to one flower and thus transitional towards var. peduncularis; of the collections named by Gray the following is selected as lectotype (Santa Cruz Redwoods, *Bolander* 55; Gray Herb.) in order to define the relation to var. peduncularis. *G. multicaulis* var. *detonsa* Gray; Mlkn., Univ. Cal. Publ. Bot. 2:35 (1904), type loc. Berkeley Hills. *G. multicaulis* var. *alba* Mlkn., Univ. Cal. Publ. Bot. 2:35 (1904), type loc. Los Gatos, Santa Clara Co., *A. L. Jaggar. G. oreophila* Greene, Baker's West American Plants 1:9 (1902), *C. F. Baker* 865 [foothills near Stanford, Santa Clara Co], nomen nudum. *G. inconspicua* var. *oreophila* Brand; Engler, Pflzr. 4^{250}:105 (1913). Var. CLIVORUM Jepson. Var. MILLEFOLIA Gray in Wats., Proc. Am. Acad. 11:118 (1876), type loc. Guadalupe Isl., *Palmer. G. nevinii* Gray, Syn. Fl. ed. 2, 2:411 (1886), type loc. San Clemente Isl., *Nevin & Lyon. G. multicaulis* var. *nevinii* Jepson, Man. 796 (1925). Var. PEDUNCULARIS Jepson. *G. peduncularis* Eastw.; Mlkn., Univ. Cal. Publ. Bot. 2:34 (May, 1904), type loc. Dutard ranch, near the boundary line betw. Santa Barbara Co. and San Luis Obispo Co. (probably w. of Santa Maria), *Eastwood;* Jepson, Man. 796 (1925). *G. pedunculata* Eastw., Bot. Gaz. 37:446 (June, 1904), type loc. "Alamo Creek," near Santa Maria, "Santa Barbara Co.," *Eastwood* (this Alamo Creek is probably in San Luis Obispo Co.). *G. pedunculata* var. *calycina* Eastw. l.c. 447, type loc. betw. Huasna and Pozo, San Luis Obispo Co., *Eastwood. G. peduncularis* var. *typica* subvar. *calycina* Brand; Engler, Pflzr. 4^{250}:108 (1907). *G. pedunculata* var. *minima* Eastw., l.c. 447, type loc. Cuyama, *Eastwood. G. peduncularis* var. *minima* Brand, l.c. 108. *G. multicaulis* var. *stricta* Brand, l.c. 110, the name based on G. stricta Scheele, Linnaea 21:755 (1848), a garden plant cultivated in Germany.

13. **G. inconspicua** Sweet. Stem stoutish, 1 or several from the base, erect or ascending, 5 to 10 inches high; herbage, peduncles and calyces glandular-puberu-

lent; leaves ½ to 2 inches long, the blades pinnately divided into discrete linear segments, the segments entire or with 1 or 2 teeth or lobes, 1 to 3 lines long; upper leaves with coarser and fewer divisions; flowers 2 to 5 in close short-pedicelled terminal clusters or sometimes solitary and terminal; calyx 3 lines long, its teeth lanceolate; corolla blue, tubular or slightly expanded upward, 3½ to 4 lines long, its tube and throat shorter than or not exceeding the calyx; corolla-throat with dark purple spots; fruiting calyx conspicuously accrescent, 4 to 6 lines long, its lobes broadly short-lanceolate; capsules large (3 to 4 lines long).

Ocean sand dunes or sandy soil, 5 to 40 feet: along the coast line from Del Norte Co. to Sonoma Co. May-June.

History of the species.—The binominal Gilia inconspicua Sweet rests directly on Ipomopsis inconspicua Sm., a species based on a garden plant grown in the year 1793 at Sion House, on the north bank of the Thames River opposite the Royal Botanic Gardens at Kew, England. The plant was raised from seed thought to have come from "America." No herbarium specimens were preserved, but the describer of the species, J. E. Smith, illustrated the diagnosis with a colored drawing in his Exotic Botany (vol. 1, t. 14,—1804). Notwithstanding the fairly extended description and the illustration, the identity of Ipomopsis inconspicua has been doubtful. Traditionally it has been regarded as the same species as Gilia inconspicua Dougl., a small-flowered Gilia published by W. J. Hooker in 1829 on the basis of a collection made by David Douglas on the "sandy barren on the southern branches of the river Columbia on the northwest coast of America, growing under the shade of Purshia tridentata and some species of Artemisia." Ipomopsis inconspicua Sm. could not, however, have been discovered in the interior of Oregon and Washington, because at the time of its cultivation in England no white man had ever traversed that region, and Gilia inconspicua Dougl. does not grow west of the Cascade Mountains. Moreover, the various forms of Gilia inconspicua Dougl. in California, here described under the name Gilia tenuiflora Benth. var. sinuata (Dougl.), do not correspond well to the description and illustration of Ipomopsis inconspicua.

The origin of the seed stirs curiosity, since in that early day it must have been derived from some coastal region, rather than an unknown and untraveled interior. Although few of them carried scientific explorers, a good many ships had visited the coast of California in the eighteenth century. Therefore, in the sense of possible physical access, the seed, to be sure, could have come from the Coast Ranges of California and it is well to consider more curiously this possibility.

In the South Coast Ranges the species Gilia multicaulis Benth. is widely distributed and often occurs near the coast line. Gilia inconspicua Sw. could not be this species, however, for the following reasons: 1. The stems and branches of Gilia multicaulis are more slender than in Ipomopsis inconspicua. 2. The foliage of Gilia multicaulis is finer or more finely divided than in Ipomopsis inconspicua. 3. The peduncles in Gilia multicaulis are more slender than in Ipomopsis inconspicua and usually with more flowers in the terminal cluster. One of the peduncles in the illustration of Ipomopsis inconspicua is rather short, rigid and 1-flowered. This type of peduncle is exactly that which is sometimes found in Gilia millefoliata of the north coast line. The peduncles of Gilia multicaulis var. peduncularis (Eastw.) are not infrequently 1-flowered, as sometimes in I. inconspicua, but the peduncles are usually long and slender or even filiform, whereas they are short and stout in I. inconspicua. 4. The inflorescence in Gilia multicaulis tends to be naked, that in I. inconspicua tends to be leafy. 5. The corolla in the type specimen of Gilia multicaulis has a slender tube with a broadly expanded throat. The corolla in Ipomopsis inconspicua is broadly tubular (and approximates the corolla of Gilia millefoliata of the North Coast Ranges). 6. In Gilia multicaulis, the corolla is 1½ to 3 times as long as the calyx. In Ipomopsis inconspicua, the corolla only slightly exceeds the calyx; it is, as it were, crowded down into the calyx (a condition which recalls that in Gilia millefoliata of the North Coast Ranges).

The region of the North Coast Ranges may next be considered. In 1838 Fischer and Meyer published a small-flowered Gilia from Bodega in Sonoma Co. as Gilia millefoliata. On the basis of the description, reprinted in Linnaea (13: Litt.-Bericht. 109,—1839) and in Erythea (2:164,—1894), and a topotype from Bodega, this is an ocean sand dune plant, usually rather low, with stoutish branching stems, flowers few in rather close glomerules or sometimes solitary, the corollas little exceeding the calyx and corolla-tube and throat not at all exceeding it, and, of most critical importance, the corolla-tube and throat tubular or only slightly expanded upwards. Nearly all, perhaps all, Gilias whose flowers are borne in close clusters or even dense heads, develop occasionally or frequently loosely-flowered or openly cymose or paniculate forms. Gilia millefoliata sometimes occurs in loosely-flowered inflorescences. Most interesting in this connection is the fact that a loose-flowered specimen of this species, which has been preserved, was grown in a garden by J. P. Tracy. On the whole, then, it is believed that a loosely flowered form of Gilia millefoliata corresponds more closely to the illustration and description of Ipomopsis inconspicua Sm. than any other available material.

Arguments for the decision that Ipomopsis inconspicua Sm., and not Gilia inconspicua Dougl., is the equivalent of Gilia millefoliata F. & M., or a form of it, are here summarized as follows: 1. Ipomopsis inconspicua Sm. is a leafy-stemmed plant, whereas Gilia inconspicua Dougl. in its prevailing form exhibits a close dense basal rosette and nearly naked stems. 2. The leafage, and especially the lobation, of Ipomopsis inconspicua Sm. correspond to occasional collections of Gilia millefoliata. It is noteworthy that the upper leaves in Gilia millefoliata have often fewer coarser lobes than the lower leaves and that this coarser type of leaf corresponds better to the upper leaves in Ipomopsis inconspicua, the only ones shown in the illustration. 3. The loose inflorescence of Ipomopsis inconspicua Sm. is well matched by such a form of Gilia millefoliata as Samoa, Humboldt Bay, *Tracy* 1921. 4. The corolla of Ipomopsis inconspicua Sm. barely exceeds the calyx, just as in Gilia millefoliata F. & M., whereas in the type of Gilia inconspicua Dougl. it is twice as long and in prevailing forms often 2 to 4 times as long. 5. The tube and throat of the corolla in Ipomopsis inconspicua Sm. are broadly tubular, just as in Gilia millefoliata F. & M., whereas in Gilia inconspicua Dougl. the very slender tube abruptly expands into a broad throat. 6. The calyx-teeth in Ipomopsis inconspicua Sm. are depicted as linear; in the type and in the prevailing form of Gilia inconspicua Dougl. the calyx-teeth are triangular-acute. Nothing quite like the linear calyx-teeth of Ipomopsis inconspicua Sm. is known either in Gilia inconspicua or Gilia millefoliata, but in Gilia millefoliata the teeth are commonly lanceolate. 7. The seed of Ipomopsis inconspicua Sm. could not have come from the untraveled interior of the Columbia River basin in that very early day; it is, as a speculation, quite possible that it was obtained on the California coast in 1792 by Archibald Menzies of the Vancouver Expedition. The seeds collected by Menzies went first to England.

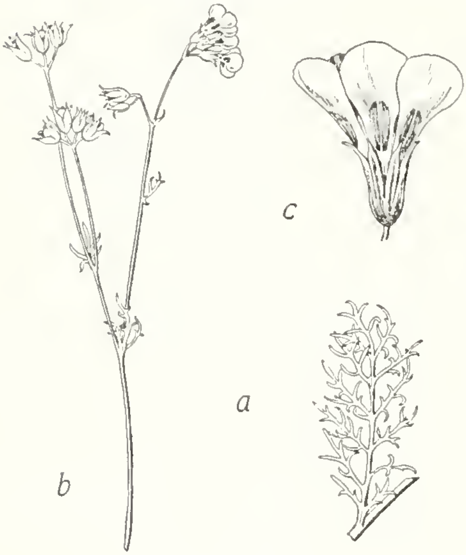

Fig. 386. Gilia tricolor Benth. *a*, cauline leaf, × ½; *b*, infl., × ½; *c*, fl., × 1½. Drawn from *Douglas* type, Royal Botanic Gardens, Kew (Herb. Benth.).

It must be pointed out that in the region of the type locality of Gilia inconspicua Dougl., collections of this species, such as that made at Lexington, Morrow Co., northeastern Oregon, *Leiberg* 15, simulate rather closely in leafage and somewhat in inflorescence the original illustration of Ipomopsis inconspicua Sm., but the sum total of the evidence, morphological and geographic, leans towards the view that Ipomopsis inconspicua Sm. is Gilia millefoliata F. & M. and this view is here adopted.

Since no type specimen exists for Ipomopsis inconspicua Sm., the following lectotype is so designated as answering most nearly the original description and illustration: Samoa, Humboldt Bay, *Tracy* 1921 (in Herbario Jepsoniano). The following collections validate the range of Gilia inconspicua Sweet: Smith River Indian Reservation, Del Norte Co., *R. Van Deventer* 309; Little River Beach, *Tracy* 4794; Samoa, Humboldt Bay, *Tracy* 14,833; Bucksport, Humboldt Co., *Tracy* 2190; Fort Bragg, *Mathews* 55; Bodega Pt., Sonoma Co., *Eastwood.*

Refs.—Gilia inconspicua Sweet, Hort. Britt. ed. 1, 286 (1827), resting on Ipomopsis inconspicua Sm., Exotic Bot. 1:25, t. 14 (1804), a garden plant cult. in England from seed believed to be from "America." *Ipomeria inconspicua* Nutt., Gen. 1:125 (1818), resting on Ipomopsis inconspicua Sm. *Cantua parviflora* Pursh, Fl. 730 (1814), resting directly on Ipomopsis inconspicua Sm. *G. parviflora* Spr., Sys. Veg. 1:626 (1825), resting on Cantua parviflora Pursh. *G. millefoliata* F. & M., Ind. Sem. Hort. Petrop. 5:35 (1838), type loc. Bodega Bay, Sonoma Co.; Linnaea 13: Litt.-Bericht. 109 (1839); Erythea 2:164 (1894). *G. multicaulis* var. *millefoliata* Jepson, Man. 796 (1925), as to north coast plants. *G. millefoliata* var. *maritima* Brand; Engler, Pflzr. 4^{250}:100 (1907), type loc. Humboldt Bay, *Eastwood.*

14. **G. tricolor** Benth. Birds Eyes. (Fig. 386.) Stem slender, erect, with few branches from or above the base, or with many branches from the base and ascending, 8 to 16 (or 21) inches high, more or less leafy on lower part, the thin basal rosette of leaves usually disappearing early; herbage glabrate to somewhat glandular; leaf-blades pinnate, 1 to 1¾ (or 3½) inches long, the petioles ¼ to ½ as long, the segments linear, mostly remote, entire or pinnately toothed or laciniately cleft, 3 to 9 lines long; flowers 1 to 5 on short (½ to 2 lines) pedicels, borne in dense terminal cymes, the cymes on slender peduncles; calyx cylindric to turbinate, some-

what glandular, 2 lines long, the slender teeth ½ to as long as the tube, the longitudinal hyaline intervals beneath the sinuses more or less dark purple; corolla funnelform, 5 to 9 lines long, tricolored, the orbicular-ovate lobes light violet-blue, shading into white toward the base, tube and base of throat yellow, top of throat spotted with dark violet; stamens equal, equally inserted just below the sinuses; anthers oval; style exceeding the stamens; capsule many-seeded.

Open foothills and flats and valley floors, 50 to 3000 feet: Coast Ranges from Humboldt Co. to Santa Clara Co. and southwestern Kern Co.; Great Valley; Sierra Nevada foothills from Butte Co. to Fresno Co. Mar.-May.

Locs.—Coast Ranges: Paskenta, sw. Tehama Co., *Virginia Bailey;* Phillipsville, Humboldt Co., *Tracy* 5467; Round Valley, ne. Mendocino Co., *Westerman;* Ukiah, *Purdy;* Lakeport, *M. S. Hazell;* Kelseyville, Lake Co., *Hordin Irwin;* Healdsburg, *Alice King;* St. Helena, *Jepson;* Corral Hollow, sw. San Joaquin Co., *Jepson* 9558; Halls Valley, Mt. Hamilton Range, *Jepson* 8239; Gilroy (hills w.), *C. F. Baker* 1942; upper Waltham Creek, sw. Fresno Co., *Jepson* 16,161; San Emigdio, Kern Co. (Zoe 4:146). Great Valley: Chico, *R. M. Austin* 92; College City, Colusa Co., *Alice King;* Marysville Buttes, *Jepson* 15,064; Woodland, *Blankinship;* Fair Oaks, Sacramento Co., *M. S. Baker;* Vacaville, *Jepson* 15,065; Antioch, *A. L. Grant;* Linden, San Joaquin Co., *F. W. Gunnison;* Irrigosa, Madera Co., *Hoover* 3937; Goshen, Tulare Co., *T. Brandegee.* Sierra Nevada: Oroville (hills 6 mi. n.), *Heller* 10,724; Knights Ferry, Stanislaus Co., *F. W. Bancroft;* Merced Falls, Mariposa Co., *J. T. Howell* 4163; Sparkville, e. of Friant, Fresno Co., *Jepson* 15,143.

Var. **longipedicellata** Greenm. Flower-clusters loose, the pedicels ⅓ to 1½ (or 2) inches long.—Sierra Nevada foothills from Shasta Co. to Kern Co.; San Joaquin Valley; Tehachapi Mts. This variety is separated from the species by only one character, but it is rarely that intergrades are found. It tends to replace the species in great part in the Sierra Nevada foothills, Tehachapi Mts. and upper San Joaquin Valley. It does not occur in the Coast Ranges unless possibly in Humboldt Co.

Locs.—Sierra Nevada foothills: Redding, *Baker & Nutting;* Red Bluff (rubble plain ne.), *Jepson* 16,349; Auburn, Placer Co., *Bolander* 4574; Sweetwater Creek, Eldorado Co., *K. Brandegee;* Willow Sprs. sta., Amador Co., *Jepson* 15,253; Italian Bar, Tuolumne Co., *A. L. Grant;* Mountain Pass (1½ mi. w.), Tuolumne Co., *Jepson* 18,084; Chowchilla School, Mariposa Co., *Jepson* 12,799; Pinehurst, Fresno Co., *Newlon* 193; Limekiln Creek, Tulare Co., *Jepson* 2795; Kaweah, *W. Fry* 109; foothills 12 mi. ne. of Bakersfield, *Allison Krames.* San Joaquin Valley: Tracy, *Benj. Cobb* (an intergrade to the species); El Nido, Merced Co., *Hoover* 4007; Orosi, Tulare Co., *H. P. Kelley;* Tipton, Tulare Co., *Jepson* 11,591; Arvin, Kern Co., *Clokey* 6813. Tehachapi Mts.: Bena, Caliente foothills, *Jepson* 11,612; Rowen, *Jepson* 6719; Fort Tejon, *Jepson* 8937.

Refs.—GILIA TRICOLOR Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas;* Trans. Hort. Soc. Loud. ser. 2, 1: t. 18, fig. 3 (1835); Jepson, Fl. W. Mid. Cal. 426 (1901), ed. 2, 331 (1911), Man. 795, fig. 773 (1925). Var. LONGIPEDICELLATA Greenm., Rhod. 6:154 (1904), type loc. Lawrence, Mass., *J. A. Collins Jr.*, an introduction from Cal. *G. diffusa* Congdon, Erythea 7:186 (1900), type loc. "new Coulterville road," Mariposa Co., *Congdon:* (isotype material is too mature for certainty, but in habit, aspect, foliage, pubescence and calyces it corresponds to this variety.—R. F. Hoover). *G. inconspicua* var. *oreophila* subvar. *diffusa* Brand; Engler, Pflzr. 4^{250}:105 (1907).

15. **G. leptomeria** Gray. Stems few to many from the base, diffusely branching, 3 to 9 inches high; herbage, or mainly the stems, glandular-puberulent; leaves all basal or all the largest basal in a dense rosette, the blades linear or oblanceolate, dentately toothed or pinnately lobed, ¼ to 1 (or 1½) inches long, shortly petioled; bracts small, oblong or linear, subtending the branches of the open-paniculate cymes; calyx ½ to 1 line long, ⅓ to ½ as long as corolla, cleft ½ or less into ovatish lobes; corolla white, pinkish or purplish, narrow-funnelform, 2 to 3 lines long, its lobes ovate-acute, often with 1 to 3 cuspidate teeth; stamens inserted in throat, very short; capsule oval or oblong, the cells many-seeded; seeds unchanged when wetted.

Desert valleys and open sagebrush plains, 2000 to 6700 feet: eastern Mohave Desert (rare); Inyo Co. and north to eastern Sierra Co. East to Arizona and Colorado, north to eastern Washington. Apr.-June.

Locs.—Eastern Mohave Desert: Barstow, *Jepson* 17,205a (det. R. F. Hoover); New York Mts., *Jepson* 5476a. Inyo Co.: Inyo, *T. Brondegee;* Darwin Wash, *Ferris* 7924; Bishop Creek, *Hall & Chandler* 7277; Laws, *Heller* 8344; Owens River Gorge (on volcanic table-land near), *Duran* 3443. Sierra Co.: Sierra Valley, *Lemmon.*

Refs.—GILIA LEPTOMERIA Gray, Proc. Am. Acad. 8:278 (1870), "mountain valleys of Nev. and Utah," *Watson;* Gray in Wats., Bot. King 270 pl. 26, figs. 6–11 (1871); Jepson, Man. 798

(1925). *G. leptomeria* var. *tridentata* Jones, Proc. Cal. Acad. ser. 2, 5:713 (1895), type loc. Emery, Utah, *Jones* 5445n. *G. triodon* Eastw., Zoe 4:121 (1893), type loc. Ruin Cañon, a branch of McElmo Creek, se. Utah, *Eastwood*. *Aliciella triodon* Brand, Helios 22:77 (1905); Engler, Pflzr. 4^{250}:150 (1907). *A. triodon* var. *humillima* Brand, l.c. 150, type loc. Inyo Co., *T. Brandegee*.

16. **G. latifolia** Wats. Coarse plants 3 to 13 inches high, the stem branching from the base with several ascending branches, or sometimes simple and erect; herbage glandular-villous; leaves subrosulate basally or the plants leafy below the inflorescence or only on the lower half, the blades 1 to 3½ inches long, ovate-oblong to orbicular, coarsely serrate or irregularly incised, the teeth or lobes cuspidate; lower leaves petioled, the petioles 5 to 11 lines long, the upper leaves subsessile; flowers borne in subpaniculate cymes; pedicels ¼ to 12 lines long; calyx glandular-hairy, cleft ½, its lobes subulate, exceeding corolla-throat or about as long; corolla short-salverform, pinkish or rose-color, 3½ to 4 lines long, the white tube about equaling the calyx-teeth, the lobes ovate, broader at the middle than at base, acute; stamens unequal, inserted on the corolla-tube; capsule oblong, the cells many-seeded; seeds not showing spiricles when wetted.

Sandy desert plains and cañon washes or rocky mesas, –10 to 4000 feet, abundant: Colorado and Mohave deserts; Inyo Co. East to Utah. Mar.-May. It has the odor of Datura meteloides.

Locs.—Colorado Desert: Coyote Wells (3 mi. w.), sw. Imperial Co., *Newlon* 399; Split Mt., *T. Brandegee;* Bailey Well, w. Imperial Co., *Jepson* 17,091; Borrego Spr., ne. San Diego Co., *Jepson* 8887; Seventeen Palms (cañon above), *Clary* 2033; County Well, n. of Indio, *Jepson* 6027; Painted Cañon, Mecca Hills, *Jepson* 11,643. Mohave Desert: Barstow, *K. Brandegee;* Calico Mts., *Lemmon;* Bagdad, *Hall* 6083; Mohave Pinnacles, 15 mi. s. of Trona, *C. N. Smith* 79. Inyo Co.: Johnson Cañon, Panamint Range, *Jepson* 19,791; Furnace Creek, Funeral Mts., Death Valley, *Jepson* 6913; Emigrant Sprs., *Parish* 10,043; pass betw. Coso Mts. and Inyo Mts., *Jepson* 19,539; Silver Cañon, White Mts., *K. Brandegee.*

Refs.—GILIA LATIFOLIA Wats., Am. Nat. 9:347 (1875), type loc. valley of the Virgin River, Utah, *Parry;* Jepson, Man. 799 (1925).

17. **G. gilmanii** Jepson sp. n. Stems 1 or a few from the base, erect or ascending, 5 to 10 inches high, the persistent bases woody and borne on a perennial root; herbage glandular-pubescent, its odor disagreeable; leaves in a basal or sub-basal tuft, the blades obovate, coarsely and somewhat sinuately dentate with spine-tipped teeth, cuneate at base, 1 to 1¾ inches long, ¾ to 1¼ inches wide (including the spines), borne on petioles ¼ to ½ inch long; lateral nerves conspicuously strong; cauline leaves reduced and bract-like, lanceolate, toothed or entire, 1 to 2 lines long; flowers borne in a corymbose panicle, the pedicels filiform, 2 to 6 lines long; calyx-lobes lanceolate-subulate, exceeding or a little shorter than the tube, nearly equaling corolla-tube; corolla funnelform, pink, 4½ to 5 lines long, cleft nearly ½ into ovate lobes; ovules about 23 to each cell; seed not known.—(Planta perennis, subfruticulosa; caules unus vel pauci ab basi, erecti vel ascendentes, 5–10 unc. alti; herba glanduloso-pubens, odioso-odorata; folia caespitosa vel subcaespitosa; laminae obovatae, remote et subsinuate spinoso-dentatae, basi cuneatae, 1–1¾ unc. longae, ¾–1¼ unc. latae; petioli ¼–½ unc. longi; nervi laterales manifeste validi; caulis folia parva et bracteata, 1–2 lin. longa; panicula corymbosa, pedicellis filiformibus, 2–6 lin. longis; calyces lobi lanceolato-subulati, tubo superantes vel subbreviores; corolla infundibuliformis, rubella, 4½–5 lin. longa, lobis ovatis tubo subaequantibus; ovarii loculi circiter 23-ovulati; semen incognitum.)

Limestone cliffs, 3500 to 4500 feet: Panamint Range and Grapevine Mts. in Inyo Co. June.

Geog. note.—Found only in the ranges about Death Valley, Gilia gilmanii is a notable addition to the list of narrow endemics peculiar to these desert mountains. Two stations are known, one on the limestone cliffs just above (southerly from) Shadscale Spring in Johnson Cañon of the Panamint Range (*Gilman* 4271, type; *Jepson* 19,789), the other in Titus Cañon, Grapevine Mts. (*Gilman* 4265). The species is named for M. French Gilman, the discoverer, in recognition of arduous feats of field work in highly difficult and inaccessible terrain of the desert ranges.

Gilia gilmanii is somewhat allied to G. latifolia. Gilia gilmanii is a woody-based perennial, the flowers with 4 short stamens and 1 long stamen which are inserted near base of corolla-tube and included in the tube. Gilia latifolia is an annual, the flowers with 3 short and 2 long stamens which are inserted near middle of corolla-tube and exserted from the throat. The leaf-blades of Gilia gilmanii are coarsely spiny-dentate; those of Gilia latifolia are spiny-dentate with the lower ones frequently pinnately divided.

Ref.—GILIA GILMANII Jepson; type loc. limestone cliffs above Shadscale Spr., Johnson Cañon, Panamint Range, *Gilman* 4271.

18. **G. depressa** Jones. Stem dichotomously branched from or above the base, somewhat divaricately diffuse, the plants 2 to 4 inches high and 3 to 9 inches broad; herbage grayish-puberulent; leaf-blades linear-lanceolate or narrowly rhomboid-lanceolate, thickish, entire, cuspidate at apex (rarely with a pair of cuspidate teeth or small lobes above the middle), 6 to 10 lines long, subsessile or narrowed to short petioles; bracts foliaceous, ovate to ovate-lanceolate, entire or with two lateral teeth; flowers solitary along the branches, or mainly or wholly in loose leafy terminal glomerules; calyx cleft ½, the lobes subulate; corolla white, tubular (or nearly so), 3 lines long, 1 to 1¼ times as long as calyx, its lobes about 1 line long; stamens included in the corolla-throat; capsule globose-ovate, its cells several-seeded; seeds showing spiricles when wetted.

Desert flats or cañons, 2900 to 5000 feet, rare: Mohave Desert; Inyo Co. East to Utah. May-June.

Locs.—Mohave Desert: Rabbit Sprs., *Parish* 1326. Inyo Co.: Argus Mts., *Purpus;* Deep Spring Valley, *Purpus* 5809 (in part).

Refs.—GILIA DEPRESSA Jones; Gray, Proc. Am. Acad. 16:106 (1880), type loc. Deseret, s. Utah, *Jones;* Jepson, Man. 796 (1925).

19. **G. polycladon** Torr. Stems few or several from the base, widely spreading, 4 to 8 inches high, the leaves remote along the branches and in a basal rosette (which disappears early); herbage minutely puberulent, the stems sometimes a little glandular; leaves ¼ to 1¼ inches long, the blades pinnatifid with 3 to 7 cuspidulate segments, narrowed gradually to a winged or unwinged petiole; flowers in close or head-like terminal clusters, the clusters very leafy-bracteate, ½ to ¾ inch broad; bracts few-toothed or pinnatifid, sometimes entire, equaling or a little exceeding (rarely 1½ times as long as) the flower-clusters; corolla tubular, white, 1 to 2 lines long, little or scarcely at all exceeding the calyx; stamens included, inserted on short filaments in the corolla-throat; capsule oval, the cells 2 (occasionally 1)-seeded; seeds showing spiricles when wetted.

Sandy soil or dry gravelly slopes, 500 to 5000 feet: Inyo Co. and eastern Mohave Desert. East to Colorado and western Texas, south to northern Mexico. Apr.-May.

Locs.—Deep Spring Valley, Inyo Co., *Purpus* 5809 in part; Daylight Pass, Grapevine Mts., *Jepson* 19,817; Johnson Cañon, Panamint Range, *Jepson* 19,678; Argus Mts. (acc. *P. A. Munz*); Needles (acc. *P. A. Munz*). Nev.: near Trail Cañon, White Mts., *V. Duran* 557; Palmetto Range, *Purpus* 5850.

Refs.—GILIA POLYCLADON Torr., Bot. Mex. Bound. 146 (1859), type loc. near El Paso, Tex., *Parry;* Jepson, Man. 796 (1925).

20. **G. campanulata** Gray. Stem diffusely branched from or above the base, 1 to 3 inches high, the branches slender; herbage obscurely puberulent, the stems somewhat glandular; leaves linear or narrowed a little towards the base, entire or with a few narrow divergent teeth, 3 to 8 lines long, subsessile, the cauline longer than the basal; flowers cymose, the filiform pedicels 1 to 4 lines long, solitary, or the flowers clustered in small glomerules; calyx parted nearly to base, the lobes broadly lanceolate with white scarious margins; corolla white (the throat yellowish), narrowly campanulate, 3 to 4 lines long, its lobes ⅓ the length of the tube, the tube 1½ to 2 times as long as the calyx; stamens included, unequal, inserted at base of corolla-tube; style included; capsule ovate, the cells several-seeded.

Sandy washes and arid slopes, 5000 to 6500 feet: eastern Inyo Co. East to southern Nevada. May-June.

Locs.—Deep Spring Valley, e. Inyo Co., *Purpus* 5828. Nev.: Belleville, *Shockley* 321; Las Vegas, *Goodding* 2321; Moapa, *Goodding* 2196.

Refs.—GILIA CAMPANULATA Gray, Proc. Am. Acad. 8:279 (1870), type loc. "foothills of Trinity Mts., Nev.," *Watson;* Gray in Wats., Bot. King 271, pl. 26, figs. 16–18 (1871); Jepson, Man. 799 (1925).

21. **G. micromeria** Gray. Stems few or several from the base, branching, 2 to 4 inches high, a little diffuse; herbage glandular-puberulent or the basal tuft of leaves subglabrous; leaves linear or oblong, pinnately parted or dentate, or entire, subsessile, 3 to 6 lines long; flowers terminating the branches, borne on pedicels 2 to 5 lines long, subpaniculate; calyx-lobes oblong; corolla white, campanulate, 1¼ lines long, cleft half-way, nearly twice as long as the calyx; ovary cells 1-ovuled.

Sandy valleys, 4000 to 6000 feet: Inyo Co. North to northwestern Nevada and southeastern Oregon. May-July.

Loc.—Only one collection is known from California and that uncertainly, since it lacks a definite station, namely, *S. W. Austin* 160 (det. A. Eastwood), from the east slope of the Sierra Nevada in Inyo Co. Another plant, Gilia inyoensis Jtn. var. breviuscula Jepson, bearing also the number, *Austin* 160, was collected in the Sierra Nevada, west of Olancha, Inyo Co.

Refs.—GILIA MICROMERIA Gray, Proc. Am. Acad. 8:279 (1870), type loc. "mountain valleys of Nevada," *Watson;* Wats., Bot. King 271, pl. 26, figs. 12–14 (1871).

22. **G. inyoensis** Jtn. Plants diffusely and usually dichotomously branched from the base, 1½ to 4 inches high, the cauline leaves small and remote, the branches thus rather naked; herbage thinly and minutely glandular-puberulent; leaves sessile, those of the basal rosette obovate to oblong or linear, sparsely dentate to entire, the upper ones linear to lanceolate, mostly entire, 1 to 2 lines long, the lower cauline ones (just above the basal rosette) often incised-dentate; flowers cymose, the pedicels filiform, divaricate, 1 to 8 lines long; calyx spreading, cleft about to middle, the lanceolate lobes scarious-margined; corolla white (the throat yellow), turbinate-campanulate, 2 to 2½ lines long, cleft ⅔ to base, the lobes broad, often emarginate or denticulate at apex; stamens equal, included, inserted at middle of corolla-tube; style exceeding or shorter than the stamens.

Sandy soil, 5200 to 7000 feet: Mono Co.; foothills on west side of Owens Valley, Inyo Co. East to western Nevada. May.

Locs.—Watterson Mdw., Mono Co., *Otto Renner* 8; Bishop (w. of), *K. Brandegee;* Lone Pine Creek, *Hall & Chandler* 7213. Nev.: Queen sta., Mineral Co., *Shockley* 374.

Var. **breviuscula** Jepson comb. n. Plants 4 to 5 inches high; corolla 2 to 2½ lines long, less spreading; stamens unequal, the longer exserted.—Southern Sierra Nevada in Tulare and Inyo Cos.: Lloyd Mdws., Tulare Co.; Sierra Nevada w. of Olancha, Inyo Co., *S. W. Austin* 160.

Refs.—GILIA INYOENSIS Jtn., Contrib. Gray Herb. 75:39 (1925), type loc. foothills west of Bishop, Inyo Co., *Heller* 8281. Var. BREVIUSCULA Jepson. *G. campanulata* var. *breviuscula* Jepson, Man. 799 (1925), type loc. Lloyd Mdws., upper Kern River, *Jepson* 4902.

23. **G. filiformis** Parry. Stem branching from near the base, diffuse or erect, 3 to 8 inches high; herbage glabrous, sometimes with a faint bloom, sometimes minutely glandular above; leaves all cauline, filiform, entire, ½ to 1 inch long; flowers paniculately cymose, borne on filiform pedicels 2½ to 12 lines long; calyx about ½ as long as corolla, cleft about half way, its lobes lanceolate, scarious-margined; corolla yellow, turbinate-campanulate, 1½ to 3 lines long, parted nearly to base into oblong lobes; stamens unequal, inserted at the middle of the corolla-tube; capsule ovate, the cells several-seeded; seeds mucilaginous when wetted.

Sandy desert mesas and talus slides in cañons, 900 to 4000 feet: eastern Mohave Desert; Inyo Co. East to Utah. May.

Field note.—The stamen filaments incurve with their anthers approximate about the style. Below the 5 apertures formed by the incurving filaments are 5 semi-transparent spots on the corolla-tube towards the base. There are also 2 parallel oblong faintly orange spots towards the base of each lobe of the corolla.

Locs.—Eastern Mohave Desert: Barstow, *K. Brandegee;* Calico Mts., *Lemmon* 3115; Newberry (on lava sw.), *Newlon* 512; betw. Kelso and Baker, *Jepson* 20,583; Cave Sprs., Avawatz Mts., *H. & M. Dearing.* Inyo Co.: Bradbury Well, s. end Black Mts., *C. L. Hitchcock* 12,360;

Hanaupah Cañon, Panamint Mts., *Jepson* 7030; Emigrant Spr., Inyo Co., *Parish* 10,193; Argus Range (n. end), *C. N. Smith* 136; Silver Cañon, White Mts., *Heller* 8220.

Refs.—GILIA FILIFORMIS Parry; Gray, Proc. Am. Acad. 10:75 (1874), type from s. Utah, *Parry;* Jepson, Man. 799 (1925). *Tintinabulum filiforme* Rydb., Fl. Rocky Mts. 698 (1917).

24. **G. gracilis** Hook. BEGGAR GILIA. (Fig. 387.) Stem erect, branched at or above the base, often diffuse or frequently simple, usually 2 to 6 (or 12) inches high, villous-pubescent, the hairs commonly glandular; leaf-blades ¼ to 1 (or 1½) inches long, puberulent or often glabrous beneath, linear to lanceolate, entire, sessile, the lowest often ovate or oblong and frequently shortly petioled; flowers few or several in terminal cymes, the cymes usually dense; calyx glandular-pubescent, cleft ⅓ to ½ its length, much distended by the enlarging fruit and split deeply or down to the base in age, the subulate lobes usually strongly recurved beneath the globose capsule; corolla red, pink or rarely white, salverform, 3½ to 5 lines long, the tube shorter than or usually little surpassing the calyx, the throat or tube often yellow or greenish-yellowish; corolla-limb 1 to 1½ (or 3) lines broad, its lobes ovatish or roundish, emarginate or entire; stamens included in the corolla-throat, the filaments inserted in the throat, 1 or 2 higher than the rest; style included, very shortly 3-cleft; capsule 1-seeded, the seeds with a thin narrow margin.

Open hills, sandy flats or opens in woods, 300 to 8600 feet: Coast Ranges from western Siskiyou Co. to San Luis Obispo Co.; Great Valley; Sierra Nevada from eastern Siskiyou Co. to Kern Co.; east side of the Sierra Nevada from Modoc Co. to Inyo Co.; Tehachapi Mts.; cismontane and intramontane Southern California. South to Lower California, east to New Mexico, Colorado and Montana, north to Alaska. South America. Mar.-May.

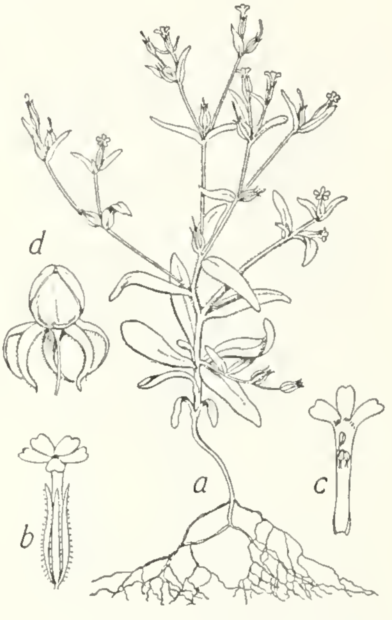

Fig. 387. GILIA GRACILIS Hook. *a*, habit, × ½; *b*, fl., × 2; *c*, long. sect. of corolla, × 2; *d*, capsule with recurving calyx-lobes, × 2.

Geog. note.—In habit Gilia gracilis varies from plants with slender erect simple stems to plants with branched erect stems or to plants much branched and extremely diffuse. Such variations are not associated with other differences and have no obvious geographic correlations. Morphologically, as to herbage, flowers and fruit, and in the features of pubescence and glandulosity, the prevailing plant in California is sufficiently constant to be taken as one unit. This prevailing form is one of wide dispersion in the various topographic areas of California, since it is absent only from the Colorado and Mohave deserts. In Southern California it is both cismontane and intramontane, while in the Sierra Nevada region it is both cismontane and transmontane. In the Sacramento and San Joaquin valleys it is of rare occurrence. The following citations are mainly of the low often (as compared with var. stricta) somewhat coarse plants which are glandular above and sometimes glandular throughout.

Locs.—Coast Ranges: Yreka, *Butler* 570; Black Butte, Sisson, *Jepson* 15,054; Summit Valley, Del Norte Co., *R. Van Deventer* 151; Grouse Mt., Humboldt Co., *Tracy* 12,699; South Fork Mt., Trinity Co., *Jepson* 16,660; Paskenta, sw. Tehama Co., *Jepson* 16,329; Larrabee Valley, Humboldt Co., *Tracy* 8691; Lodoga, w. Colusa Co., *Jepson* 16,276; Ukiah, *Purdy;* Davis Hills, Vacaville, *Jepson* 15,051; St. Helena (hills e.), *Jepson* 15,056; Mt. Tamalpais, *Chesnut & Drew;* San Bruno Hills, San Francisco, *Jepson* 15,053; Mt. Diablo, *Jepson* 9846; Mt. Hamilton, *Jepson* 4215; San Benito Peak, San Carlos Range, *Jepson* 2717 (condensed dwarfs ½ inch high); Zapato Chino Creek, sw. Fresno Co., *Jepson* 15,368; Carrizo Plain, *Jepson* 12,013; San Luis Hot Sprs., *Condit.* Great Valley: Marysville Buttes, *Jepson* 15,057; College City, Colusa Co., *Alice King;* Tracy, *Hoover* 1736; Kettleman Hills, *Hoover* 2933. Sierra Nevada: Bear Flat, se. Siskiyou Co., *Jepson* 20,120; Burney Valley, Shasta Co., *Baker & Nutting;* Blairsden, Plumas Co., *Ewan* 8240; Smartsville, Yuba Co., *Jepson* 15,052; Bear Valley, Nevada Co., *Jepson* 15,058; Fallen Leaf Lake, Eldorado Co., *Ottley* 819; Hodgdon Ranch near Tuolumne Grove, *Jepson* 10,536; Marble Fork near Giant Forest, *Jepson* 652; Junction Mdw., upper Kern Cañon, *Jepson* 1049a; Greenhorn Pass, Kern Co., *Purpus* 5701. East side Sierra Nevada: Egg Lake, Modoc Co., *Nutting;* Madeline Plains, Lassen Co., *Loughridge;* Sierraville, *Keck* 433; Jackass Spr., Nelson Range, Inyo Co., *Hall & Chandler* 7125. Tehachapi Mts.: betw. Monolith and Tehachapi, *Allison Krames;* Bear Mt., *Jepson* 7179. Cismontane and intramontane S. Cal.: Lockwood Valley, Mt. Piños, *Hoffmann;* San Marcos Pass, Santa Ynez Mts., *Hoffmann;* Leouis Valley, n. Los Angeles Co., *Davy* 2630; Piñon Ridge, San Gabriel Mts., *Peirson* 2484; San Bernardino Mts., *Parish;* Witch Creek, e. San Diego Co., *Alderson;* Banner, e. San Diego Co., *T. Brandegee.*

In the northerly parts of California two slight and hazy variants emerge through the medium of intergrades: Var. STRICTA Brand. Stems slender, very strictly or rigidly erect, glandular-pubescent (at least above), commonly non-glandular below, frequently sub-glabrous or glabrous below, mostly 8 to 11 inches high, simple or branched only at summit, the cymes relatively loose; leaves narrowly lanceolate, glabrous or subglabrous, at least below, sometimes finely ciliolate or villous-ciliolate; calyx glandular-pubescent.—Montane valleys or flats, 2300 to 5200 feet: eastern Tehama Co. (Battle Creek Mdw., Mineral, *Jepson* 12,272); Siskiyou Co. (Edgewood, *Kisling*); Humboldt Co. (Larrabee Valley, *Tracy* 8791, "flowering a month later than associated small plants of the species"; Corral Prairie, Trinity Summit, *Tracy* 14,146). North to Washington. In no two collections studied is the segregation of pubescence on the various parts of the plant the same.

Var. GLABELLA Brand. Habit of the species; upper portions of stem and calyces glabrous, lower part of stem pubescent but less glandular than in the species; leaves as in the species, glabrous beneath; cymes open.—Valley flats, 2000 to 2500 feet: Humboldt Co. (Larrabee Valley, *Tracy* 8692). North to Washington.

In the Sierra Nevada foothills is a form of more significance because definitely restricted to a limited area: Var. VILLOSA Jepson & Hoover var. n. Simple, erect, usually markedly villous, especially above; corolla purple or crimson throughout (both the lobes and the tube).—(Caulis simplex, erectus, fere valde villosus, praesertim supra; flos per totam corollam purpureus vel puniceus.)—Lower foothills from Placer Co. to Calaveras Co.: Auburn, *Bolander* 4508; Pilot Hill, Eldorado Co., *Jepson* 15,762 (type); Nashville, Eldorado Co., *Jepson* 18,655; Ione, Amador Co., *Jepson* 18,666; Mokelumne Hill, *Blaisdell.*

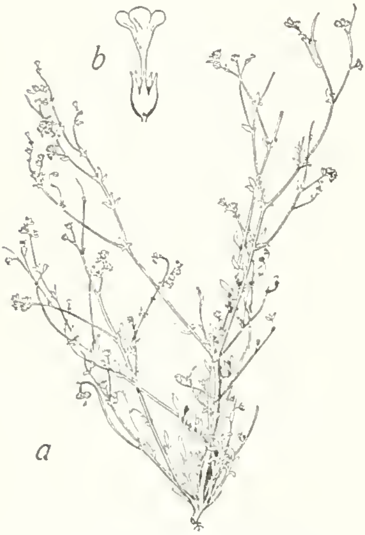

Fig. 388. GILIA GILIOIDES Greene. *a*, habit, × ¼; *b*, fl., × 4. Drawn from *Douglas* type, Royal Botanic Gardens, Kew (Herb. Benth.).

Refs.—GILIA GRACILIS Hook., Bot. Mag. t. 2924 (1829), based on a cultivated plant (London Horticultural Society), originally collected by *Douglas* "on light soils, on the banks of the Spokane River [Wash.] and on high ground near Flathead River [Ida.], in Northwest America"; Jepson, Fl. W. Mid. Cal. 425 (1901), ed. 2, 330 (1911). *Collomia gracilis* Dougl.; Hook., l.c. *Phlox gracilis* Greene, Pitt. 1:141 (1887); Jepson, Man. 787, fig. 767 (1925). *Microsteris gracilis* Greene, Pitt. 3:300 (1898). *Collomia micrantha* Kell., Proc. Cal. Acad. 3:18, fig. 3 (1863), type loc. Silver City, Nev., *Dunn. Microsteris micrantha* Greene, Pitt. 3:303 (1898). *G. gracilis* var. *micrantha* Brand; Engler, Pflzr. 4^{250}:91 (1907). *Microsteris californica* Greene, Pitt. 3:302 (1898), "Coast Range of middle and northern Cal., thence eastward to the Sierra Nevada"; (corolla described as wholly red but plants having such corollas are not known in the Coast Ranges.—R. F. Hoover). *G. gracilis* var. *eritrichoides* subvar. *californica* Brand, l.c. Var. STRICTA Brand; Engler, Pflzr. 4^{250}:89 (1907). *Microsteris stricta* Greene, Pitt. 3:302 (1898), "ne. Cal. and adjacent Ore." Var. GLABELLA Brand; Engler, Pflzr. 4^{250}:91 (1907). *M. glabella* Greene, Pitt. 3:301 (1898), type loc. Falcon Valley, Wash., *Suksdorf. G. humilis* var. *glabella* Piper, Contrib. U. S. Nat. Herb. 11:461 (1906). Var. VILLOSA Jepson & Hoover. *G. gracilis* var. *eritrichoides* subvar. *californica* Brand, l.c. 91; probably not *Microsteris californica* Greene.

25. **G. gilioides** Greene. (Fig. 388.) Stem erect, loosely branching, leafy, 4 to 15 (or 23) inches high, or the few branches diffusely spreading, ½ to 2½ feet long; herbage more or less villous or pilose and glutinous; leaves ½ to 1¾ (or 2¾) inches long, mostly petioled, the blades narrow-obovate to oblanceolate or linear, entire or with a salient tooth on each side, or the blades pinnately cleft or pinnate with 3 to

5 (or 13) lobes or leaflets; lobes or leaflets entire, rarely toothed, commonly very unequal; blades of upper leaves commonly trifid, often very different in shape from the lower leaves; flowers on slender pedicels, arranged in open irregular cymes or glomerate, minutely bracteate or conspicuously leafy-bracteate; calyx very glandular-hairy, scarious below sinuses to base; calyx-lobes erect, linear or subulate, equaling the tube or longer; corolla tubular-funnelform, white, blue, purple or rarely red-pink, 2½ to 5 lines long, 2 to 3 times as long as the calyx, the limb 1 to 1½ lines broad; stamens unequal and unequally inserted on the corolla-throat (about the middle or below), included in the throat or the longer with anthers barely exserted; style included or rarely exserted; capsule globose, its cells 1 (rarely 2)-seeded; seeds becoming mucilaginous when wetted.

Dry sandy flats or hills or wooded cañon sides, 2500 to 9000 feet: common throughout the Coast Ranges (mostly towards the interior), Sierra Nevada and cismontane Southern California, less frequent on the east side of the Sierra Nevada, rare in the Sacramento Valley (100 to 500 feet) and absent from the San Joaquin Valley, Mohave Desert (except west side) and Colorado Desert. South to Lower California, east to western Nevada and north to southern Oregon. Mar.-Aug.

Locs.—Coast Ranges: Sisson, Siskiyou Co., *Jepson* 15,061; Hyampum, Trinity Co., *Chesnut & Drew;* Greasewood Hills, near Mt. Tom, w. Tehama Co., *Jepson* 15,067; Alder Sprs. (10 mi. e.), n. Glenn Co., *Heller* 11,438; Mt. Konocti, Lake Co., *Jepson* 15,059; Howell Mt., Napa Range, *Jepson* 15,060; Mt. Diablo, *Bowerman* 1907; Saratoga (s. of), Santa Cruz Mts., *Pendleton* 130; Lopez Cañon, San Luis Obispo Co., *Unangst.* Sacramento Valley: Sacramento, *T. Brandegee.* Sierra Nevada: Jonesville, *Copeland;* Pioneer road sta., North Fork Yuba River, *Jepson* 16,799; Bear Valley, Nevada Co., *Jepson* 15,062; Strawberry road sta., Eldorado Co., *Jepson* 16,886; Myers sta., near Lake Tahoe, *Ottley* 940; Silver Valley, Alpine Co., *Jepson* 10,148; Cow Creek, Tuolumne Co., *Jepson* 6514; Hetch-Hetchy, *Jepson* 3449; Lake Merced, Merced River, *Jepson* 3197; Fresno Big Trees, Madera Co., *Jepson* 15,973; Graveyard Mdw., near Silver Pass, Fresno Co., *A. L. Grant* 1513b; Big Creek, Fresno Co., *I. T. Walker;* Shaver Lake, Fresno Co., *Jepson* 16,097; betw. Tehipite Valley and Gnat Mdw., *E. Ferguson* 535; South Fork Middle Tule River, *Jepson* 4872; Portuguese Mdw., s. Tulare Co., *C. N. Smith* 16. East side of the Sierra Nevada: Forestdale, sw. Modoc Co., *M. S. Baker;* Susanville, *T. Brandegee;* Sierra Valley, *Lemmon;* Mogul, Mono Co., *Yates* 5310; Pleasant Cañon, Panamint Range, *Hall & Chandler* 6967. Western Mohave Desert: Manzana, Antelope Valley, *Davy* 2516. Cismontane S. Cal.: Mt. Piños, *Hoffmann;* Zaca road, San Rafael Mts., *Hoffmann;* Vandeventer Flat, Santa Rosa Mts., *Jepson* 1416; Escondido, San Diego Co., *C. V. Meyer* 117; Cuyamaca Mts., *Palmer* 234.

Note on variation.—Gilia gilioides is remarkably unstable; it is unstable in habit, in shape of leaves and in form of inflorescence,—these are the features most subject to variation. A characteristic leaf diversity as found on a single individual is as follows: leaves entire or toothed on the lower part of the plant, leaves pinnately divided (with 3 to 5 or 9 or sometimes 13 lobes) at the middle of the plant, and leaves trifid above. The segments of the leaves or leaflets vary greatly in size and shape. Variation in habit, ranging from coarse plants to delicate plants, is equally striking. Notwithstanding all this, variation is confined within certain limits and tends to characterize or place its peculiar seal upon the entity. The character of the variation, in other words, marks well the species, almost as well as an invariable constant. Collections are, therefore, usually referred with certainty to this species. Only three varieties are here described:

Var. **volcanica** (Brand) Jepson & Hoover comb. n. Corolla 6 to 10 lines long, 2 to 3 lines broad, the tube purple, the lobes white or pale; stamens unequal, the longer conspicuously exserted, the filaments unequally inserted, the upper at about middle of throat, the lower at base of throat; style shorter than corolla-tube.—Sierra Nevada foothills from Eldorado Co. to Mariposa Co.; also in Lake Co. (intermediate towards the species).

Locs.—Sierra Nevada foothills: Sweetwater Creek, Eldorado Co., *K. Brandegee;* Avery sta., Calaveras Co., *A. L. Grant;* Bear Mt., Calaveras Co., *Davy* 1456; Yankee Hill, Tuolumne Co., *Jepson* 6416; Columbia, *Jepson* 6418; Cold Spr., Bald Mt., Tuolumne Co., *Jepson* 6465; Coulterville, Mariposa Co., *Hoover* 2160. Lake Co. (corolla similar, but stamens apparently never exserted): Snow Mt., *T. Brandegee;* Binkley ranch, near Cobb Mt., *Jussel* 159.

Var. **ianthina** Jepson & Hoover var. n. Leaves or their lobes usually narrow, the lower leaves (save in depauperate plants) mostly with 5 to 15 lobes; flowers 3 to 7, crowded in capitate clusters; corolla bright violet-blue.—(Folia vel lobi fere angusti; folia basilaria plerumque 5–15-lobata; flores 3–7, dense capitati; corolla violaceo-azurea.)—Inner Coast Range and its east-side foothills from western Shasta Co. to southwestern Kern Co.; Sierra Nevada foothills from Fresno Co. to Kern Co.; south to the western San Gabriel Mts. It intergrades to typical Gilia gilioides.

Locs.—Inner Coast Range: Anderson, Shasta Co., *Alice King;* Paskenta (6 mi. w.), *Virginia Bailey;* Lodoga, Colusa Co., *Jepson* 16,271 (type); Mt. Diablo, *Bowerman* 2919; Mt. Hamilton, *Pendleton* 904; Little Panoche Pass, San Benito Co., *Hoover* 3012; North Fork Lewis Creek, se. Monterey Co., *Jepson* 2679; Alcalde, sw. Fresno Co., *T. Brandegee;* San Emigdio Cañon, Kern Co., *Davy* 2019. Sierra Nevada: betw. Dunlap and Pinehurst, Fresno Co., *Newlon* 158; Cedar Creek, Tulare Co., *W. Fry* 351; Laver's Mdw., Greenhorn Mts., *Kromes.* Tehachapi Mts.: Keene, *Jepson* 7186; Bear Mt., *Jepson* 7178. San Gabriel Mts. (w. end): Tujunga Cañon, *MacFadden* 20r.

Var. **glutinosa** (Benth.) Jepson. Leaves sometimes bipinnatifid, the lobes broader than in var. ianthina; corolla 2 to 3 lines broad; stamens unequal, the longer conspicuously exserted, the filaments equally or somewhat unequally inserted on base of corolla-throat.—Coastal S. Cal.: San Marcos Pass, Santa Ynez Mts., *Hoffmann* 793; Santa Barbara, *Jepson* 12,132; Ojai Valley, Ventura Co., *Thacher* 75; Malibu, Los Angeles Co., *Barber;* Topanga, Los Angeles Co., *Barber;* Eaton Cañon, San Gabriel Mts., *Peirson* 153; Big Dalton Cañon, San Gabriel Mts., *Peirson* 293; San Bernardino foothills, *Parish;* San Jacinto Mts., *Condit;* Temescal, Riverside Co., *Hall* 582; Palomar Mt., *Jepson* 1513; Dehesa, San Diego Co., *Spencer* 63. South to L. Cal.

Refs.—GILIA GILIOIDES Greene, Erythea 1:93 (1893); Jepson, Fl. W. Mid. Cal. 425 (1901), ed. 2, 330 (1911), Man. 797, fig. 774 (1925). *Collomia gilioides* Benth., Bot. Reg. 19: sub t. 1622 (1833), type from Cal., *Douglas. G. divaricata* Nutt., Jour. Acad. Phila. n. ser. 1:155 (1848), type loc. Monterey, *Gambel. G. violacea* Hel., Muhl. 1:56 (1904), type loc. Donner Lake, Nevada Co., *Heller* 6873. *G. gilioides* var. *benthamiana* Brand; Engler, Pflzr. 4^{250}:93 (1907), type loc. Grants Pass, Ore., *Howell. G. gilioides* var. *greeneana* Brand, l.c., type from Sonoma Co., *Greene;* Jepson, Man. 797 (1925). *G. gilioides* var. *integrifolia* Brand, l.c., type loc. Pine Ridge, Fresno Co., *Hall & Chandler* 67. Var. VOLCANICA Jepson & Hoover. *G. divaricata* var. *volcanica* Brand, l.c. 94, type loc. Volcano, Amador Co., *Hansen* 1764. Var. IANTHINA Jepson & Hoover, type loc. Lodoga, w. Colusa Co., *Jepson* 16,271. Var. GLUTINOSA Jepson, Man. 797 (1925). *Collomia glutinosa* Benth., l.c., type from Cal., *Douglas. C. gilioides* var. *glutinosa* Gray, Proc. Am. Acad. 8:260 (1870). *G. glutinosa* Gray, Syn. Fl. ed. 2, 2:408 (1886).

G. traskiae Eastw.; Mlkn., Univ. Cal. Publ. Bot. 2:26 (1904), type loc. Santa Catalina Isl., *Trask;* Jepson, Man. 796 (1925). The original description was based on two collections (both Santa Catalina Isl.): the type collection (*Trask*) in the California Academy of Sciences Herbarium is now destitute of flowers; the *T. Brandegee* collection in the University of California Herbarium has no perfect flowers and none at all in situ. Knowledge of the corolla and stamens is, in consequence, inadequate, but it is possible that both the Santa Catalina collections represent very young plants, in which case the original diagnosis of the corolla might be specially interpreted. It may be remembered that in many Polemoniaceae, some time after the corolla-limb attains its full diameter, the corolla-tube often elongates conspicuously. Aside from the little-known flower, this may be said: In habit, branching, aspect and inflorescence, and especially in leaves and pubescence Gilia traskiae agrees remarkably with various collections of Gilia gilioides var. glutinosa. The pattern and the lobation of the pinnately divided leaves of the type collection are matched by the leafage of Gilia gilioides var. glutinosa in such a collection as Eaton Cañon, San Gabriel Mts., *Peirson* 153. Both the villous spreading hairs and the very short hairs of Gilia traskiae are closely matched by the pubescence in *Peirson* 153. These collections are also similar in that the calyces in both are rather deeply cleft into ovate-lanceolate or lanceolate lobes. This reference of the name Gilia traskiae is further confirmed by a recent flowering collection of Gilia gilioides var. glutinosa in Hamilton Cañon, Santa Catalina Island, *Fosberg* 15,413.

8. **GYMNOSTERIS** Greene

Diminutive annuals with leafless simple stems. Proper leaves none, the cotyledons persistent, connate-perfoliate. Flowers few in terminal heads, the 4 bracts united at base and forming a distinct involucre. Calyx-tube membranous, the lobes lanceolate, slightly unequal, about as long as the tube. Corolla salverform or slender-funnelform, white or yellow. Anthers sessile in the corolla-throat. Capsule 3-celled, dehiscent, 10 to 18-seeded.—Species 3, North America. (Greek gymnos, naked, and steros, foundation or prop, referring to the leafless stem.)

Cotyledons remote from involucre; involucre several (3 to 6)-flowered; style cleft ⅛; var. parvula of........1. *G. nudicaulis.*
Cotyledons closely subtending involucre or rarely somewhat removed; involucre 1 (or 3)-flowered; style cleft to middle or a little below........2. *G. minuscula.*

1. **G. nudicaulis** Greene var. **parvula** (Rydb.) Jepson. Plants 1 to 1½ inches high; involucre 3 to 4½ lines long; corolla 3 to 4 lines long, its lobes acutish, ⅓ to ¼ the length of the tube.

Cañon bottoms, 4000 to 5000 feet: east side of the Sierra Nevada in Nevada Co. East to Colorado, north to eastern Oregon and to Idaho. Apr.-May.

Loc.—Prosser Creek, Nevada Co., *Sonne.*

Refs.—GYMNOSTERIS NUDICAULIS Greene, Pitt. 3:304 (1898). *Collomia nudicaulis* H. & A., Bot. Beech. 368 (1840), type loc. "Green River, Snake Country," *Tolmie*. *Gilia nudicaulis* Gray, Proc. Am. Acad. 8:266 (1870). *Linanthus nudicaulis* Howell, Fl. Nw. Am. 456 (1903). Var. PARVULA Jepson, Man. 809 (1925). *Gilia parvula* Rydb., Mem. N. Y. Bot. Gard. 1:320 (1900), type loc. Swan Lake, Yellowstone Park, *Tweedy* 823. *Gymnosteris parvula* Hel., Muhl. 1:3 (1904). *Gymnosteris pulchella* Greene, Pitt. 3:304 (1898), type loc. Steamboat Sprs., Washoe Co., Nev., *Sonne*.

2. **G. minuscula** Jepson. Plants 2 to 4 lines high; involucre 1½ to 1¾ lines long; corolla white, fading yellowish, 1¼ lines long, exceeding the calyx, its throat yellowish, its lobes short, obtuse, ⅑ to ⅛ the length of the tube; capsule about 13 to 18-seeded.

Alpine gravelly or sandy slopes, 10,300 to 11,800 feet: White Mts., Mono Co. July.

Locs.—Sheep Mt.; Big Prospector Mdw., *Jepson* 7309.

Ref.—GYMNOSTERIS MINUSCULA Jepson, Man. 809 (1925), type loc. Sheep Mt., White Mts., Mono Co., *Jepson* 7326 (typ. in Herbario Jepsoniano).

9. **LINANTHUS** Benth.

Low slender annuals. Leaves opposite, palmately divided to the base into filiform, narrowly linear or oblanceolate divisions (thus almost seeming as if in whorls in some species), very rarely entire, rarely some uppermost ones alternate. Flowers scattered or in terminal capitate clusters. Calyx-tube commonly scarious between the ribs or angles, its teeth usually equal. Corolla campanulate, funnelform, or salverform. Stamens equally inserted on the corolla. Capsule with few to many seeds in each cell.—Linanthus maculatus has entire leaves, as have also species of the section Eulinanthus, partially or wholly.—Species about 50, western North America and Chile. (Greek linon, flax, and anthos, flower.)

A. Corolla campanulate to funnelform, its proper tube very short or obscure, much shorter than the throat; transmontane deserts or mostly so (except no. 6).—Subgenus PARRYA.

Flowers 2 to 4 lines long; corolla-throat without protuberances; calyx-lobes a little unequal; corolla white.
  Leaves oblong-linear, entire; disk at base of corolla 5-lobed; Colorado Desert..1. *L. maculatus.*
  Leaves mostly trifid; disk at base of corolla entire; e. Mohave Desert and Inyo Co.................... 2. *L. demissus.*
Flowers 5 to 9 lines long; calyx-lobes equal.
  Corolla-lobes entire; filaments glabrous; leaves palmately cleft or parted.
    Corolla pink; calyx-lobes ovate; stems filiform-wiry, almost naked; se. San Diego Co....... 3. *L. bellus.*
    Corolla white; calyx-lobes subulate or lanceolate; stems a little stouter, leafy.
      Corolla-throat without protuberances; calyx-lobes subulate, not membranous-margined or only slightly, arising abruptly from the truncate border of the membranous calyx-tube; San Antonio Mts., S. Cal...............4. *L. concinnus.*
      Corolla-throat with somewhat sac-like protuberances; calyx-lobes lanceolate, broadly membranous-margined, the sinuses acute; Mohave Desert (and its bordering ranges), South Coast Ranges and Inyo Co...........................5. *L. parryae.*
  Corolla-lobes dentate; corolla usually pink; filaments hairy at base; leaves linear and entire; cismontane S. Cal. and w. Colorado Desert..6. *L. dianthiflorus.*

B. Corolla funnelform or salverform, the tube equaling the throat, usually several times longer.

1. Flowers mostly scattered, usually solitary in the axils or terminal.

Leaf-blades mostly linear and entire (some parted or divided in nos. 7 and 10).—Subgenus EULINANTHUS.
  Corolla 9 to 15 lines long, 12 to 15 lines broad, the throat almost obsolete; stamens inserted near base of corolla-tube, hairy at base; anthers linear-oblong; seeds with a loose honey-comb testa; leaf-blades palmately divided or linear and entire; cismontane and transmontane..7. *L. dichotomus.*
  Corolla 3 to 6 (or 8) lines long, 1 to 4 lines broad; corolla-throat ½ to as long as corolla-tube, obscurely differentiated from the tube; stamens inserted at base of throat, glabrous; anthers oblong; seeds with a close testa; mostly transmontane deserts.

Plants 2½ to 9 inches high; leaf-blades linear and entire.

Flowers mostly sessile; corolla white; seeds angular, narrowly margined, often pointed at one end........8. *L. bigelovii.*

Flowers pedicelled; corolla yellow; seeds narrowly margined, notched on one side, the notch with a white horseshoe-shaped border........9. *L. jonesii.*

Plants ¼ to 2½ inches high; leaves 3-parted, or linear and entire; seeds reniform, constricted at the hilum........10. *L. arenicola.*

Leaf-blades palmately parted or divided into 3 to 7 linear or oblanceolate segments; flowers ¾ to 8 lines long.—Subgenus DACTYLOPHYLLUM.

Corolla golden or cream yellow; stamens inserted on upper part of corolla-throat; S. Cal.

Flowers mostly in close glomerules, subsessile to short-pedicelled (the pedicels ½ to 1½ lines long)........11. *L. lemmonii.*

Flowers paniculately cymose, long-pediceled (the pedicels 2 to 8 lines long)........12. *L. aureus.*

Corolla white (sometimes pink in no. 13; blue in nos. 16 and 17).

Stamens inserted on lower part of corolla-throat; calyx turbinate or cup-shaped; corolla white (rarely pink-tinged); capsule-cells several-seeded.

Corolla 2 to 8 lines long, 2 to 3 times as long as calyx; filaments hairy at base.

Plants diffuse, branching from the base, the branches at length dichotomous; foothills of North Coast Ranges and Sierra Nevada........13. *L. filipes.*

Plants erect, the stem simple below, branching above, the branches mostly simple; widely distributed........14. *L. liniflorus.*

Corolla ¾ to 2 lines long, 1 to 1½ times as long as calyx; filaments glabrous at base (except in var.); capsule-cells 1-seeded (except in var.); North Coast Ranges and Sierra Nevada........15. *L. harknessii.*

Stamens inserted about the middle or upper part of corolla-throat, glabrous, no hairy ring at insertion of stamens, often a hairy ring on lower part of corolla-tube inside.

Corolla blue, purplish or lilac.

Corolla 6 to 10 lines long; calyx clavate-cylindric, its lobes ¼ to ½ as long as the tube; Coast Ranges........16. *L. rattanii.*

Corolla 3 to 4 (or 6) lines long; calyx cylindric, its lobes broadly lanceolate, ⅙ to ¼ as long as the tube; Coast Ranges and Sierra Nevada........17. *L. bolanderi.*

Corolla white, 1¼ to 2½ lines long; calyx-lobes linear-lanceolate, about ⅔ to as long as the tube; widely distributed........18. *L. pygmaeus.*

2. Flowers sessile in dense clusters or heads.

Corolla funnelform or tubular-funnelform, the tube as long to twice as long as throat.—Subgenus PACIFICUS.

Calyx-lobes shorter than the calyx-tube, not membranous-margined; corolla-tube ¼ to ½ as long as the corolla-lobes; outer Coast Ranges........19. *L. grandiflorus.*

Calyx-lobes 3 to 4 times as long as the calyx-tube, membranous-margined; corolla-tube longer than the corolla-lobes; San Diego Co........20. *L. orcuttii.*

Corolla strictly salverform, the tube slender-filiform, mostly 10 to 20 times (or at least 4 or 5 times) as long as the throat; calyx cleft nearly to base or at least half-way.—Subgenus LEPTOSIPHON.

Calyx not membranous or only slightly membranous below the sinuses.

Corolla-lobes 2½ to 5 lines long, 1½ to 3 lines broad; stamens inserted about middle of corolla-throat, the anthers barely exserted from throat; bracts and calyces coarsely ciliate or hispid-pubescent to glabrate.

Corolla-tube 1½ to 2 times as long as calyx; corolla white to cream-color; capsule-cells 1 to 3-seeded; Sierra Nevada........21. *L. serrulatus.*

Corolla-tube 3 to 6 times as long as calyx; corolla white to crimson, lavender or yellow; capsule-cells about 3 to 6-seeded; Coast Ranges and Santa Ana Mts........22. *L. androsaceus.*

Corolla-lobes 1 to 3 lines long, ½ to 1½ lines broad; stamens inserted in lower part of corolla-throat, exserted from corolla-throat but not as long as corolla-lobes.

Corolla-lobes 1½ to 3 lines long; corolla purple, pink, pale yellow or white; bracts and calyces finely puberulent, the calyx-lobes sometimes ciliate; mainly Coast Ranges and coastal S. Cal........23. *L. parviflorus.*

Corolla-lobes 1 to 1¼ lines long; corolla pinkish or purplish (or white) with a yellow throat, or golden; bracts and calyces often coarsely pubescent, the calyx-lobes coarsely ciliate to nearly glabrous; cismontane Cal., widely spread........24. *L. bicolor.*

Calyx membranous to base below sinuses.
Bracts of inflorescence 6 to 9 (5 to 13) lines long, coarsely long-ciliate.
Corolla pink or purple, its lobes 1 to 1½ lines long, with or without a purple spot at base; cismontane Cal., widely spread..................25. *L. ciliatus.*
Corolla pink or white, its lobes 2½ to 3½ lines long, a purple spot at base; Sierra Nevada; San Bernardino Mts............................26. *L. montanus.*
Bracts of inflorescence 2 to 3 lines long, short-hirsute with spreading hairs.
Leaf-segments linear; corolla 7 to 15 lines long, its lobes obovate, obtuse; flowers in both axillary and terminal clusters or only terminal.
Corolla 7½ to 15 lines long, its limb 5 to 7½ lines broad, its tube glabrous; calyx hirsutulous; cent. Mohave Desert and San Bernardino Mts. 27. *L. breviculus.*
Corolla 7 to 9 lines long, its limb 4 to 5 lines broad, its tube finely but rather densely spreading-hirsutulous; s. Sierra Nevada and Tehachapi Mts..28. *L. nashianus.*
Leaf-segments oblanceolate; corolla 4 to 6 lines long, its lobes quadrate, truncate or emarginate; flowers in terminal clusters, occasionally 1 or 2 in the uppermost axils; upper Kern River basin........29. *L. oblanceolatus.*

1. **L. maculatus** Mlkn. Stem branched from the base, ¾ to 1¼ inches high, sparsely pubescent, equably leafy; leaf-blades oblong-linear, entire, cuspidate, thick, puberulent above, glabrous below, 1 to 2 lines long; earlier flowers subsessile in the lower forks, the later ones crowded above in small head-like clusters; calyx parted almost to base, nearly equaling the corolla-lobes; calyx-lobes oblong-linear, ciliate, with a hyaline margin, evidently unequal, cuspidate; corolla campanulate, white, 2 lines long, the lobes broader than long, about ⅓ as long as throat and tube; stamens included in throat, inserted at the summit of the very short proper tube; capsule oval, the cells several-seeded; seeds unchanged when wetted.

Sandy flats and washes, 500 to 2200 feet: northwest arm (Conchilla Desert) of the Colorado Desert and desert floor on the north side of the Conchilla Mts. Mar.-Apr.

Note on endemism.—Linanthus maculatus is a narrow endemic restricted to the flats and valleys bordering the Conchilla Range, that is, the Conchilla Desert on the south side and the desert floor on the north side. Not only is it a narrow endemic, but the number of stations for it and the number of individuals of it appear to be limited, five collections only being known to us: Whitewater River, *Wilder* 704; probably Conchilla Desert, *Wright* 1820 (bearing no exact station, but S. B. Parish says that Wright on this trip from San Bernardino went no further into the Colorado Desert than Palm Springs and its immediate valley floor); Coyote Holes (Bull. S. Cal. Acad. 24:50); betw. Morongo Valley and Twentynine Palms, *Daniels;* Twentynine Palms (8 mi. s.), *J. Keck* 3843.

Refs.—LINANTHUS MACULATUS Mlkn., Univ. Cal. Publ. Bot. 2:55 (1904); Jepson, Man. 800 (1925). *Gilia maculata* Parish, Bull. Torr. Club 19:93 (1892), type loc. "Agua Caliente, San Diego Co." (that is, Palm Sprs., e. base Mt. San Jacinto, now Riverside Co.), *W. G. Wright.*

2. **L. demissus** Greene. Stem branched from or near the base, the branches ascending, ½ to 3 inches long, equally leafy throughout; herbage glabrate or thinly puberulent, sparingly and microscopically glandular; leaves trifidly divided with spreading or divergent lobes, or entire, the blade or its lobes linear, conspicuously cuspidate, 2½ to 5 lines long; flowers in close leafy cymes, short-pediceled; calyx divided nearly to base into lanceolate lobes with hyaline or white-scarious margins, exceeding the corolla-throat; calyx-tube below sinuses scarious; corolla campanulate, white with purple-streaked throat, 2½ to 4 lines long; corolla-lobes quadratish-oblong, ⅔ as long as throat, the proper tube very short, pale yellow, the stamens inserted almost on its summit, about as long as corolla-throat; capsule oblong-oval, ½ as long as the calyx; cells several-seeded; seeds unchanged when wetted.

Desert plains and cañons, 2000 to 7500 feet: eastern Mohave Desert; southeastern Inyo Co. East to Arizona and Utah. Apr.-May.

Flower note.—The lobes of the corolla are a little twisted and thus resemble the fans of a turbine windmill. The calyx-lobes are unequal, 3 large and 2 small.

Locs.—Mohave Desert: Barstow, *Jepson* 17,200; Calico Wash, Calico Mts., *Jepson* 5408; Daggett, *Mary Beal;* Kelso Mts., *Jepson* 20,581; Willow Springs Cañon, Old Dad Mts., *Jepson* 20,503; Danby, *Newlon* 528; Tiefort Mt. (flats near), *Jepson* 17,263. Inyo Co.: near Gold Valley, Black Mts., *Saylor* 280; *Pleasant* Cañon, Panamint Range, *Hall & Chandler* 6943; Emigrant Sprs., Death Valley, *Parish* 10,195.

Refs.—LINANTHUS DEMISSUS Greene, Pitt. 2:257 (1892); Jepson, Man. 801 (1925). *Gilia demissa* Gray, Proc. Am. Acad. 8:263 (1870), based on "se. Cal. and adjacent Ariz.," *Fremont;* Rothrock, Bot. Wheeler Exped. pl. 19B (1878).

Gilia dactylophylla Torr., Bot. Ives 22 (1860), "mouth of Diamond River," Ariz., *Newberry*, is cited by Gray as a synonym of Gilia demissa Gray (Linanthus demissus Greene). On the basis alone of the few words of description, Torrey's name might as easily apply to any one of several species of Linanthus. It is, therefore, a nomen subnudum. *L. dactylophyllus* Rydb., Fl. Rocky Mts. 698 (1917).

3. **L. bellus** Greene. Stems several to many from the base, subprostrate, filiform-wiry, glabrous or nearly so, nearly naked (bearing one whorl of leaves at the base or middle), 1 to 1¾ inches long; leaves 3-cleft, 1 line long, sparingly villous at base, the lobes carinate; flowers 1 to 3, sessile in close terminal clusters; calyx equaling the throat of the corolla, 2 lines long, glabrous, deeply cleft into ovate lobes, the lobes 3-ridged on back, membranous-margined; corolla rotate-campanulate, pink or rose-purple, with purple spots in throat, 6 lines long, the very short tube (½ line long) and the throat (2 lines long) shorter than the lobes; stamens inserted at summit of corolla-tube, included in throat; filaments slightly dilated downwards, with a trench-like pit at insertion; ovary 3-angled.

Hillslopes, 2500 to 3000 feet: southeastern San Diego Co. and southwestern Colorado Desert. South to northern Lower California. May.

Locs.—Boulevard sta. (3½ mi. w.), nw. of Jacumba, *W. I. Follett* 33; sw. Colorado Desert (Erythea 3:61).

Refs.—LINANTHUS BELLUS Greene, Pitt. 2:256 (1892). *Gilia bella* Gray, Proc. Am. Acad. 20:301 (1885), type loc. Hanson ranch, L. Cal., *Orcutt*. *L. peirsonii* Mason, Madroño, 2:23 (1931), type loc. Tecate (14 mi. se.), L. Cal., *Peirson* 5844.

4. **L. concinnus** Mlkn. Stem loosely branched, the branches ascending, 2 to 5 inches high; herbage sparingly puberulent and obscurely glandular, the bracts and calyx-lobes a little villous-ciliate; leaves opposite, at least below, palmately 3 to 7-parted into linear or linear-spatulate acerose or cuspidate lobes, 3 to 6 lines long; flowers in bracteate loosely glomerate cymes; calyx-tube conspicuously hyaline-membranous, its 5 narrow ribs excurrent from the markedly truncate border as subulate lobes, the lobes ¼ to ⅓ as long as the tube; corolla funnel-form, white with a yellowish tube and throat, 5 to 7½ lines long, 4½ to 6 lines wide, the limb equaling the tube and throat, the tube about ¾ line long; filaments inserted in the corolla-tube, somewhat dilated at base; capsule ovoid-oblong, the cells 2 to 4-seeded; seeds about a line long, unchanged when wetted.

Sandy hill slopes or dry rocky habitats in the mountains, 5000 to 8000 feet, infrequent: San Gabriel Mts.; San Bernardino Mts. May-June.

Locs.—San Gabriel Mts.: Mt. Lowe, *Peirson* in litt.; North Fork San Antonio Creek, e. San Gabriel Mts., *Peirson* 2142; Swartout Cañon, *Hall;* Icehouse Cañon, *Johnston;* Lytle Creek Cañon. San Bernardino Mts.: Baldwin Lake, acc. *Peirson*.

Refs.—LINANTHUS CONCINNUS Mlkn., Univ. Cal. Publ. Bot. 2:53 (1904), based on Gilia modesta Hall; Jepson, Man. 801 (1925). *Gilia modesta* Hall, Bot. Gaz. 31:389 (1901), type loc. Lytle Creek Cañon, trail to Mt. San Antonio, *Hall* 1443; not *G. modesta* Philippi (1895). *G. parryae* var. *modesta* Brand; Engler, Pflzr. 4^{250}:145 (1907). *Gilia concinna* Munz, Man. 396 (1935).

5. **L. parryae** Greene. Stem compactly branched from the base or usually, 1 to 2½ (or 3) inches high; herbage puberulent; leaves opposite, at least below, the blades palmately 3 to 7-parted into acerose segments, 2 to 5 lines long; flowers several to numerous, congested in leafy cymes; calyx-lobes lanceolate-subulate, broadly scarious-margined, microscopically ciliate, 2 to 3 times as long as the calyx-tube; corolla funnelform, yellow (with dark throat) or bluish-lilac, or white, 5 to 8 lines long, 6 to 9 lines wide, the lobes nearly twice as long as tube and throat combined, the very short tube ¼ to ½ as long as the throat; throat bearing beneath each corolla-lobe a pair of purple or white saccate protuberances or reniform arches, the tips of the arches continued down the throat as line-like ridges; filaments dilated

at base, inserted at the summit of the corolla-tube; anthers barely exserted from corolla-throat; ovary 3-angled; capsule obovate, the cells many-seeded; seeds minute, scarcely $\frac{1}{6}$ line long, showing spiricles slightly when wetted.

Sandy desert flats, alkaline or sterile playas, or hard soil of arid mountain slopes, 2000 to 6300 feet: South Coast Ranges in Monterey and San Luis Obispo Cos.; southern Sierra Nevada in Kern Co.; Mono Co.; Inyo Co.; Mohave Desert. Mar.-June.

Locs.—South Coast Ranges: Vineyard Cañon, Monterey Co., *Wiggins* 8016; Creston, San Luis Obispo Co., *Otto Renner;* Estrella, San Luis Obispo Co., *Jared.* Tehachapi Mts.: Tehachapi (Zoe 2:77). Sierra Nevada in Kern Co.: betw. Greenhorn Summit and Kernville, *C. N. Smith* 381; Walker Pass, *Purpus* 5405; Cottonwood Creek, Piute Mts., *C. N. Smith* 177. Mono Co.: Benton sta., *Duran* 3242. Inyo Co.: Lone Pine, *T. Brandegee;* Homewood Cañon, Argus Range, *Bailey & Robison.* Mohave Desert (and the desert slopes of its bordering ranges): Red Rock Cañon, w. end El Paso Mts., *Allison Kramer;* Calico Wash (n. of Daggett), *Jepson* 5402; betw. Barstow and Stoddard Well, *Mary Beal;* Amargo, *Jepson* 15,581; Kramer, *Jepson* 5402a; Luna Mt., n. slope San Bernardino Mts., *Axelrod* 403; Horsethief Cañon, *Clokey* 6823; Cajon Pass, *Jepson* 6118; Neenach, Antelope Valley, *Jepson* 19,243; Little Rock Creek, San Gabriel Mts., *Peirson* 940.

Refs.—LINANTHUS PARRYAE Greene, Pitt. 2:256 (1892); Jepson, Man. 801 (1925). *Gilia parryae* Gray, Proc. Am. Acad. 12:76 (1876), type loc. near head of the Mohave River, n. slope San Bernardino Mts., *Parry & Lemmon;* Lemmon, Pac. Rural Press 13:34 (1876). *G. kennedyi* Porter, Bot. Gaz. 2:77 (1877), type loc. Kern Co., *W. L. Kennedy.*

6. **L. dianthiflorus** Greene. FRINGED GILIA. Stem branching, erect or spreading, 2 to 6 inches high; herbage subglabrous or minutely puberulent; leaves opposite below but frequently alternate above, linear-filiform, entire, 2 to 7 (or 15) lines long; plants abundantly floriferous, the flowers in small few-flowered leafy cymes, the pedicels shorter than the calyx; calyx usually cleft to the middle, its lobes linear, membranous-margined at base; corolla funnelform, bright pink or lilac (the lobes often white at base, sometimes wholly white), 6 to 9 lines long, $5\frac{1}{2}$ to 10 lines wide, its lobes dentate, about equalling the combined length of tube and throat; throat yellow, marked with 5 spots, $1\frac{1}{4}$ to 2 times as long as the yellowish or purplish tube; stamens inserted in corolla-tube, included in the throat, the filaments hairy and dilated at the base; stigmas spirally twisted, spreading horizontally; capsule oblong, the cells many-seeded; seeds winged.

Sandy ground of open valley fields or open hillsides or sometimes in cañon flats, 50 to 4400 feet: coastal Southern California from Santa Barbara to the San Bernardino Valley and south to San Diego Co.; west side of the Colorado Desert. South to Lower California. Jan.-May.

Locs.—Coastal S. Cal.: Santa Barbara, *J. E. Roadhouse;* Christys Harbor, Santa Cruz Isl., *Hoffmann;* Santa Catalina Isl. (Erythea 7:142); San Fernando Valley, *Brewer* 161; Claremont, *C. F. Baker* 4062; San Bernardino, *Parish;* Lugonia, e. San Bernardino Valley, *Parish;* San Jacinto Lake, *Jepson* 1238a; betw. Coahuilla Valley and Aguanga, *Jepson* 1478; Anaheim, *Alice King;* Elsinore, *Jepson* 19,144; Ramona, *Jepson* 8516; Oak Grove Valley, e. San Diego Co., *Jepson* 17,147; Warner Pass, *Jepson* 8746; Santa Isabel, *Jepson* 17,140; Mesa Grande, San Diego Co., *E. Ferguson* 45; Mt. Soledad, near La Jolla, *Newlon* 274; San Diego, *Jepson* 6656.

Refs.—LINANTHUS DIANTHIFLORUS Greene, Pitt. 2:254 (1892); Jepson, Man. 801 (1925). *Fenzlia dianthiflora* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas.* *Gilia dianthoides* Endl., Atakta Bot. t. 29 (1833). *G. fenzlia* Steud., Nom. Bot. ed. 2, 1:683 (1840). *Fenzlia speciosa* Nutt., Proc. Acad. Phila. 4:12 (1848), type loc. Santa Catalina Isl., *Gambel.* *F. concinna* Nutt., l.c. type loc. San Diego, *Nuttall.* *Gilia dianthoides* var. *farinosa* Brand; Engler, Pflzr. 4^{250}:131 (1907), type loc. San Bernardino Co., *Parish* 36.

7. **L. dichotomus** Benth. EVENING SNOW. (Fig. 389.) Stem simple or dichotomously branched, 3 to 6 (or 15) inches high; flowers on short pedicels in the forks or terminal, the pedicels $\frac{1}{4}$ to 2 lines long; herbage glabrous with a glaucous tinge; leaves entire or palmately 3 to 5 or 7-divided, the blade or its divisions narrowly linear or filiform, 6 to 12 lines long; flowers opening in late afternoon or at sunset and closing the next morning; calyx cylindraceous with conspicuous hyaline intervals, glabrous, its subulate lobes spreading, $\frac{1}{3}$ or $\frac{1}{4}$ as long as the tube; corolla

tubular-salverform, white with a brownish throat, ½ to 1¼ inches broad, ¾ to 1¼ inches long, about 2 times as long as calyx, the lobes a little exceeding the tube and strongly convolute in the bud; stamens inserted in lower part of corolla-tube, included in the throat; filaments with a hairy pad at base; style very short, about equaling the ovary; capsule oblong, the cells many-seeded; seeds with a loose white bladdery testa, the testa alveolate, the hilum seated at the base of a small and rather deep circular cavity.

Dry hillslopes and sandy or gravelly flats, 600 to 5000 feet; Coast Ranges from Tehama Co. to San Luis Obispo Co. (always back of the coast line); Sacramento Valley; Sierra Nevada from Butte Co. to Kern Co.; Inyo Co.; Mohave Desert and its bordering ranges; Santa Rosa Mts. (west side of the Colorado Desert). Mar.-June.

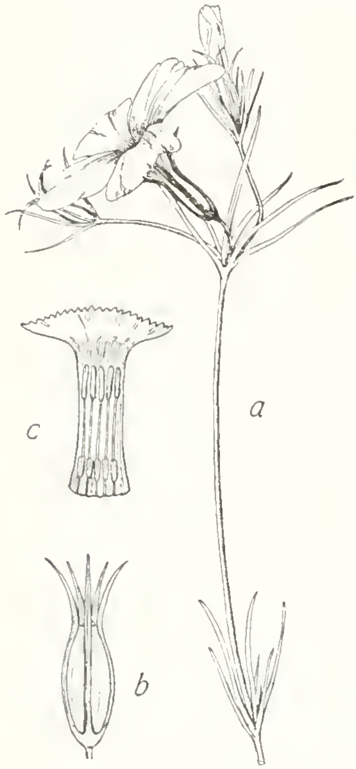

Fig. 389. LINANTHUS DICHOTOMUS Benth. *a*, flowering branch, × 1; *b*, calyx, × 2; *c*, corolla-tube spread out, × 2.

Locs.—Coast Ranges: Paskenta (6 mi. w.), w. Tehama Co., *Virginia Bailey;* Indian Valley, ne. Lake Co., *M. S. Hazell;* Conn Valley, Napa Range, *Jepson* 10,313; Dry Creek, nw. of Napa, acc. *E. M. Smith;* Sonoma, *Brewer* 969; Corral Hollow, w. San Joaquin Co., *Jepson* 9597; Stanford, *C. F. Baker* 529; Mt. Hamilton, *Jepson* 4194; Jolon, Monterey Co., *Wiggins* 8032; San Carlos Creek, San Carlos Range, *Jepson* 2723; Hernandez (4 mi. nw.), s. San Benito Co., *R. S. Ferris;* Coalinga, sw. Fresno Co., *Jepson* 17,013; Carrizo plain (low hills at n. end), se. San Luis Obispo Co., *Jepson* 12,020; San Emigdio (Zoe 4:146). Sacramento Valley: Crane Creek near Rosewood, w. Tehama Co., *Jepson;* Marysville Buttes, *Jepson* 20,926; Roseville, Placer Co., *Shockley.* Sierra Nevada: Butte Co. (Man. 802); Sweetwater Creek, Eldorado Co., *K. Brandegee;* Hetch-Hetchy, *A. L. Grant;* Yosemite Valley, *Jepson* 10,482a; Ahwahnee, Madera Co., *Jepson* 12,825; Sequoia Park, *Fry;* lower Kern River foothills, *Benson* 2977. Inyo Co.: Bishop Creek, *Hall & Chandler* 7236; Maturangos Spr., Argus Mts. (Contrib. U. S. Nat. Herb. 4:153). Ranges bordering the western Mohave Desert: Tehachapi Pass, *Jepson* 17,334a; Mt. Piños, *Hoffmann;* Los Alamos Valley, Santa Barbara Co., *Jepson* 20,272; Elizabeth Lake, Los Angeles Co., *Hall* 3065; Arraster Creek, San Gabriel Mts., *Peirson* 393a; Cajon Pass, *Jepson* 6131; Santa Ana Cañon, San Bernardino Mts., *Parish.* Mohave Desert: Hesperia, *Newlon* 471; Kramer, *Mary Beal;* Barstow, *Jepson* 5392; Daggett, *Mary Beal;* Calico Mts., *Jepson* 17,239; Paradise Spring (3 mi. ne.), Paradise Mts., *Jepson* 20,353; Quail Spr., 10 mi. se. of Warrens Well, *Saylor* 247; Hole-in-the-Wall, Providence Mts., *Jepson* 18,341. Mountains on w. side Colorado Desert: Piñon Well, mts. n. of Indio, *Jepson* 5994; Vandeventer Flat, Santa Rosa Mts., *Jepson* 1463a; Jacumba, se. San Diego Co., *T. Brandegee.*

Refs.—LINANTHUS DICHOTOMUS Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 430 (1901), ed. 2, 334 (1911), Man. 801, fig. 776 (1925). *Gilia dichotoma* Benth.; DC., Prodr. 9:314 (1845). *G. linanthus* Steud., Nom. Bot. ed. 2, 1:684 (1840). *G. dichotoma* var. *uniflora* Brand; Engler, Pflzr. 4^{250}:144 (1907), type from Cal., *Bolander.*

8. **L. bigelovii** Greene. Stem erect, usually simple below, dichotomously branched above, 3 to 9 inches high, the flowers subsessile in the forks or terminal on the branchlets; herbage glabrous, pallid; leaves opposite throughout, the blades very narrowly linear and entire, or rarely 2 or 3-parted, ½ to 1¼ inches long; flowers mostly sessile (rarely pedicelled) in the forks (above the middle of the plant, rarely from the base) and terminal; calyx cylindrical, glabrous, with very conspicuous hyaline intervals between the ribs, 4 to 6 lines long, its spreading lobes 1 to 1⅓ lines long; corolla funnelform-tubular, white, with a dark circle in the throat, 4 to 6 (or 8) lines long, exceeded by or exceeding the calyx, its limb 1½ to

3 (or 4) lines broad; corolla-tube well developed and twice as long as the lobes, the lobes usually strongly convolute in bud and 1 to 2 lines long; stamens with short filaments, inserted at base of corolla-throat and included in throat; filaments glabrous at base; style 3-cleft a little more than ½, the stigmas standing just below the anthers; capsule oblong, the cells many-seeded; seeds reddish-brown with a closely enveloping testa, shortly angular-cylindric, usually pointed at one end, rugulose or punctate, the angles narrowly white-margined.

Desert slopes and arid valleys, 2000 to 5300 feet: Colorado Desert; Mohave Desert and its bordering ranges; inner South Coast Range from San Luis Obispo Co. to Stanislaus Co.; Inyo Co. East to southern Utah and western Texas, south to Lower California. Apr.-June.

Locs.—Colorado Desert and its west-bordering ranges: summit of Mountain Springs grade, e. San Diego Co., *Jepson* 11,814; Blair Valley, e. San Diego Co., *Jepson* 8675; Coachella (10 mi. w.), *Hall* 5816. Mohave Desert and its bordering ranges: Middle Creek, Mt. Piños, *Hall* 6482; Amargo, *Jepson* 15,583; Kramer, *Mary Beal* 395; Calico Mts., *Lemmon;* Willow Springs Cañon, Old Dad Mts., *Jepson* 20,415; Fountain Cañon, Providence Mts., *Jepson* 18,210a; Barnwell, New York Mts., *K. Brandegee.* Inner South Coast Range: Carrizo Plain, se. San Luis Obispo Co., *Keck & Clausen* 3150; Lewis Creek, ne. of Lonoak, e. Monterey Co., *Keck* 2769; New Idria, San Carlos Range (Zoe 4:155); Puerto Cañon, w. Stanislaus Co., *Hoover* 4342. Inyo Co.: Johnson Cañon, Panamint Range, *Jepson* 19,680; Inyo, *T. Brandegee.*

Refs.—LINANTHUS BIGELOVII Greene, Pitt. 2:253 (1892); Jepson, Man. 802 (1925). *Gilia bigelovii* Gray, Proc. Am. Acad. 8:265 (1870), based on *G. dichotoma* var. *parviflora* Torr., Bot. Mex. Bound. 147 (1859), Cook's Spr. and near Frontera, Tex., *Bigelow, Wright.*

9. **L. jonesii** Greene. Stems slender (usually wiry or filiform), dichotomously and diffusely branched or sometimes sparingly branched, 2½ to 6 inches high; herbage glabrous or subglabrous, the pedicels and bracts sparsely set with gland-tipped hairs; leaf-blades filiform, entire, 4 to 10 lines long, the uppermost or bracteal leaves similar; flowers on pedicels ¼ to 4 lines long, terminal and in the forks from near the base of the plant; calyx 2 to 4 lines long, the 5 ribs or nerves of the calyx-tube lightly covered with stipitate glands or the glands sometimes very few, the intervals between the ribs markedly scarious to base; calyx-lobes linear, erect in anthesis, about ⅓ as long as the tube; corolla salverform, yellow or buckskin color, 4 to 5 lines long, a little exceeding the calyx, its lobes 1 to 4 lines long; stamens inserted at base of corolla-throat, included in throat; capsule oblong, many-seeded; seeds reddish-brown, closely covered by the testa, the hilum in a deep notch on one side and bordered by a white membranous margin or horse-shoe shaped figure.

Desert flats and mesas, 500 to 2000 feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. East to Arizona, south to Lower California. Mar.-May.

Note on the seed.—The immature seeds are clay-color and somewhat flattish, narrowly wing-margined, eventually becoming reddish. The fully mature seeds are reddish-brown, irregularly cylindric-curved or angular, often punctate or rugulose, the angles narrowly white-margined. The hilum is seated in a deep notch on one side, the notch bordered by a narrow membranous margin in such a way as to make a white horseshoe-shaped figure on one side of the seed.

Locs.—Inyo Co.: Inyo, *T. Brandegee;* Panamint Cañon, Panamint Range, *Hall & Chandler* 7054. Eastern Mohave Desert: near Garlic Sprs., Tiefort Mt., *Jepson* 17,266a; Amboy Crater, *Jepson* 20,309; Needles, *Parish* 9613. Colorado Desert: Coachella, *Hall* 5816.

Refs.—LINANTHUS JONESII Greene, Pitt. 2:254 (1892). *Gilia jonesii* Gray, Syn. Fl. ed. 2, 2:407 (1886), type loc. Needles, *Jones.* *G. bigelovii* var. *jonesii* Brand; Engler, Pflzr. 4^{250}:144 (1907). *Linanthus bigelovii* var. *jonesii* Jepson & Mason; Jepson, Man. 802 (1925).

10. **L. arenicola** (Jones) Jepson & Bailey comb. n. Desert dwarf, compactly di- or tri-chotomously branched, ¼ to 2½ inches high, equably leafy to the summit, the stems thinly and microscopically puberulent; leaves linear and entire or those above the base of the stem or above the middle palmately 3 (or 2)-cleft into linear lobes, strongly ribbed, villous above, glabrous below, 1 to 6 lines long; flowers solitary in the crowded axils from near the base of the plant upward and finally terminal on the branches; calyx obscurely contorted, in anthesis slightly constricted at the mouth with the lobes spreading or divergent, strongly ribbed with the intervals

scarious, 2½ to 3 lines long; calyx-lobes villous within, ⅓ to ½ as long as the tube; corolla salverform, yellow, equaling or shorter than the calyx, 2½ to 2¾ lines long, its lobes about ⅓ as long as the tube and throat; stamens unequally inserted low on the throat and ½ as long as the throat; cells of the ovary with 9 ovules; capsule many-seeded, the seeds reniform.

Alkaline playas or flats or desert washes, 500 to 2400 feet: eastern Mohave Desert. Mar.-Apr.

Geog. note.—Linanthus arenicola is a singular endemic known from only five stations in the eastern Mohave Desert as follows: Barstow, *Curran;* Searles Lake, *Mason* 8232; Poison Cañon, west of Trona, *Charlotte Smith* 37; Kelso, *Jones* 9995; Needles, acc. *Jones.* Its peculiarities and apparent relationships seem so remarkable that further collections of this diminutive gilioid annual are desirable. On some individuals the leaves are mostly palmately 3-parted, some being 2-parted, some entire. On other individuals, the leaves are mostly entire, some being palmately 3-parted. Or again, midway of the stem there may be a pair of leaves of which one leaf of the pair is quite entire and the other 3-parted. The basal pair of leaves, or sometimes 2 or 3 pairs, are at base connate-sheathing, the base or sheath being about ¼ to ½ line long. Likewise, the cotyledons are remarkably connate-tubular at base, the tube or sheath being 4 lines long. The stamens are not only unequally inserted, but even in a small collection, it appears that no two corollas show quite the same pattern of stamen insertion.

Refs.—LINANTHUS ARENICOLA Jepson & Bailey. *Gilia arenicola* Jones, Contrib. W. Bot. 13:2 (1910), type loc. Needles, *Jones* 10,447. *L. mohavensis* Mason, Madroño 4:158 (1938), type loc. Searles Lake, 1 mi. s. of Trona, ne. Mohave Desert, *Mason* 8232; also collected in Poison Cañon (4 or 5 mi. s. of Trona), *Mason* 8294.

11. **L. lemmonii** Greene. Stem diffusely branched from the base, spreading, 2 to 6 inches high, often forming a low rounded clump 4 to 12 inches broad; herbage puberulent or somewhat canescent; leaf-blades palmately divided into 3 to 5 linear lobes, 1 to 2 lines long, somewhat ciliate; flowers sessile or subsessile in terminal head-like glomerules; calyx puberulent or villous, equaling or a little exceeding the corolla-throat, its lobes lanceolate, about as long as the calyx-tube; corolla funnelform, 2½ to 3½ lines long, dull or pale cream-white or yellowish with the deep yellow throat often with red-purple markings, the tube about 1 line long and equaling the broad throat, the lobes 1 to 1½ lines long; stamens exserted from corolla-throat, the filaments inserted in upper part of throat; capsule oblong, the cells many-seeded.

Sandy flats or sandy hillslopes and gravelly mesas, 1000 to 5500 feet: inner valleys and mountain slopes of cismontane Southern California from the San Bernardino Valley to eastern San Diego Co.; west side of the Colorado Desert. South to Lower California. Apr.-June.

Locs.—Cismontane S. Cal.: Lugonia, e. San Bernardino Valley, *Parish;* Banning, *T. Brandegee;* Strawberry Valley, Mt. San Jacinto, *Jepson* 1296; betw. Chalk Hill and Thomas Valley, San Jacinto Mts, *Jepson* 1324; Hemet Lake, Riverside Co., *Clary* 975; Elsinore, *McClatchie* 36; Oak Grove Valley, San Diego Co., *Jepson* 17,148. Colorado Desert (west side): Collins Valley, ne. San Diego Co., *Jepson* 8840; San Felipe Valley, *Jepson* 8730; Box Cañon, Blair Valley, e. San Diego Co., *Jepson* 8653; Vallecito, e. San Diego Co., *Jepson* 8913; Boulevard sta., e. San Diego Co., *W. I. Follett* 34.

Refs.—LINANTHUS LEMMONII Greene, Pitt. 2:257 (1892); Jepson, Man. 802 (1925). *Gilia lemmonii* Gray, Syn. Fl. 2:394 (1878), type loc. "S. E. California in San Bernardino Co.," *Parry & Lemmon* (that is, at Crafton, acc. to herb. label in Lemmon Herbarium. Crafton is in the San Bernardino Valley, cismontane San Bernardino Co. The species does not occur in the "Mohave Desert" as stated in Synoptical Flora, ed. 2, 2:407).

12. **L. aureus** Greene. Stem diffusely and usually widely branched, 1½ to 7 inches high; herbage glabrate to puberulent, occasionally a little glandular; leaf-blades palmately divided into 3 to 7 linear lobes, 1½ to 3 lines long; flowers on capillary pedicels in small paniculate cymes; calyx puberulent to glabrate, 2 to 2½ lines long, its teeth ⅓ to ⅗ as long as the tube, the tube villous inside; corolla lemon-yellow with a brownish or orange throat, funnelform, 4 to 7 lines long, the tube whitish to dark purple, included in calyx, slightly shorter than the throat; stamens inserted in the sinuses or a little below; capsule ovoid, the cells many-seeded; seeds small, showing spiricles when wetted.

Sandy flats, mesas and washes, 700 to 4000 (or 6000) feet, often very abundant locally: coastal Southern California back of the coast line from the San Bernardino Valley to Ventura Co.; Colorado and Mohave deserts; southern Sierra Nevada in Kern Co.; Inyo Co. East to Nevada and western Texas. Apr.-June.

Field note.—In some portions of the deserts Linanthus aureus is infrequent; in other portions it is locally abundant, forming colonies here and there an acre or several acres or even several square miles in extent. A flower character is that the 3 linear stigmas diverge horizontally. The corolla with yellow limb and orange throat represents the prevailing form, but there is also a form with white or pale violet corolla.

Locs.—Coastal S. Cal.: Riverside, *Koethen* 13; San Bernardino, *Parish;* Santa Anita Wash, San Gabriel Mts., *Peirson* 2111; Big Tujunga Cañon, San Gabriel Mts., *Peirson* 343; San Fernando Valley (Dav. & Mox., Fl. S. Cal. 292); Lockwood Valley, Mt. Piños, *Hoffmann.* Colorado Desert: Mountain Springs grade, *Orcutt* 234; Vallecito, *Jepson* 8606; Box Cañon, Mason Valley, e. San Diego Co., *Jepson* 8654; Pleasant Valley, near Lookout Mt., Conchilla Range, *Jepson* 5983; Cottonwood Spr., Eagle Mts., *Jepson* 12,554. Mohave Desert: Manzana, Antelope Valley, *Davy;* Hesperia, *Newlon* 474; Domingo ranch valley, Providence Mts., *Jepson* 18,274; Hole-in-the-Wall, Providence Mts., *Jepson* 18,328; Cedar Cañon, Mid Hills, Providence Mts., *Jepson* 18,336; Barnwell, New York Mts., *Jepson* 5441. Southern Sierra Nevada in Kern Co.: Walker Pass, *Jepson* 19,874. Inyo Co.: Argus Mts., *Purpus* 5404; Bishop, *Almeda Nordyke;* Laws, *Heller* 8199.

Var. **decorus** (Gray) Jepson. Corolla white or pale violet.—Sandy flats and sandy plains, in and bordering the Providence Mts., 2300 to 5000 feet: Fountain Cañon, *Jepson* 18,204; plain east of Mitchell Caverns, *Jepson* 18,300.

Geog. note.—The white-flowered form, var. decorus of Linanthus aureus, is abundant in the eastern Mohave Desert in seasons of above-average rainfall. Its probable center of distribution is here described: On the gently sloping plain extending upward from the Amboy basin northerly to the base of the Old Dad Mountains, it is found, at this time (in late April, 1941), in colonies about one-fourth mile square (*Jepson* 20,368), filling the sandy opens between the bushes of Larrea tridentata var. glutinosa, Franseria dumosa and Lepidium fremontii. Linanthus aureus was not observed here. Thirty miles north of this station, on the mesa which slopes downward and northward towards the Kelso Sand-dunes it occurs again in an extensive colony covering several miles (*Jepson* 20,540). Crossing the broad wash which runs westerly from the Kelso Sand-dunes and ascending the mesa towards the great mountain mass, Kelso Mountains, lying between Kelso and Baker, var. decorus is found again in great areas above Kelso (*Jepson* 20,580). Higher up it is replaced by an equally extensive colony of Linanthus aureus (*Jepson* 20,579). These colonies meet but do not overlap and mingle, unless marginally. Proceeding through a mountain pass and coming out onto a great plateau lying on the westerly side of the mountain mass referred to, a colony of Linanthus aureus, about four to five miles long and as wide, is encountered (*Jepson* 20,594), the shrubs of the mesa in this area being very widely spaced. Farther down the slope towards Baker, var. decorus is again found in a broad colony two miles across (*Jepson* 20,595). Each of these colonies consists exclusively of either Linanthus aureus or its var. decorus. The colonies of var. decorus, while clearly belonging to this varietal unit, represent in each case, however, a slightly distinctive strain. Were the white-flowered plants found growing mingled with the golden-flowered plants, significance of the white-flowered state might well be completed by describing it simply as a color form. On account of geographic segregation, however, these color forms take on added significance, since they are indicators of micro-climatic or ecological areas.

Refs.—LINANTHUS AUREUS Greene, Pitt. 2:257 (1892); Jepson, Man. 802 (1925). *Gilia aurea* Nutt., Proc. Acad. Phila. 4:11 (1848), type loc. "Santa Barbara" (but undoubtedly towards the interior), *Gambel. G. aurea* f. *laeta* Brand; Engler, Pflzr. 4^{250}:131 (1907), type loc. Ventura Co., *Grinnell* 7. *G. aurea* f. *pallescens* Brand, l.c., type from S. Cal., *Jones* 3186. Var. DECORUS Jepson, Man. 803 (1925). *Gilia aurea* var. *decora* Gray, Proc. Am. Acad. 8:264 (1870), type from Cal., *Fremont. G. aurea* f. *decora* Brand, l.c.

13. **L. filipes** Greene. (Fig. 390.) Stem dichotomously and diffusely much branched, or sometimes erect, 2 to 6 inches high, the branches filiform; herbage puberulent, sometimes villous at base; leaf-blades palmately 5-parted into filiform or acicular segments, $1\frac{1}{2}$ to 4 lines long; inflorescence dichotomously paniculate-cymose; pedicels filiform, 2 to 5 lines long; calyx usually narrow-turbinate, hispidulose, $\frac{2}{5}$ as long as the corolla, the lobes $\frac{1}{3}$ to nearly as long as the calyx-tube, somewhat pungent-tipped; corolla short-funnelform, white to pink or lilac, 2 to 3 lines long, with a hairy ring in the tube; stamens exserted from the corolla-throat, the filaments inserted near the base of the throat; style exceeding the stamens; capsule-cells several-seeded.

Open or openly wooded slopes or flats in the foothills, 200 to 4500 feet: North Coast Ranges from Solano Co. to Shasta Co. (and the rolling plains immediately bordering their foothills on the west side of the Sacramento Valley) and to Humboldt Co.; Marysville Buttes; Sierra Nevada foothills from Kern Co. to Shasta Co. and also on the rolling plains immediately bordering the foothills on the east side of the Great Valley. Abundant. Apr.-July.

Field note.—Linanthus filipes, an inhabitant of open grassy hills and openly wooded slopes, is of early summer-flowering annuals doubtless the species of greatest abundance in individuals throughout the length of the Sierra Nevada foothills, that is, during the period of initial dryness. Frequently it forms quite pure colonies 10 to 12 feet in diameter. The leaf-divisions are densely fascicled on the lower part of the stem. When the internodes of the lower part of the stem are very short and the congestion of fascicles in such cases vary marked, this feature is reminiscent of the main stems of Leptodactylon species, notwithstanding that plants of Linanthus filipes are annual and so delicate and those of Leptodactylon are perennial and so coarse.

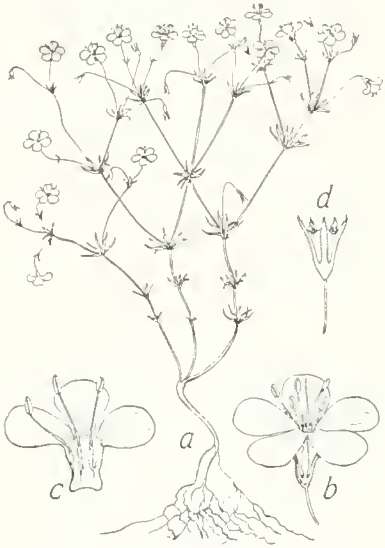

Fig. 390. LINANTHUS FILIPES Greene. *a*, habit, × ½; *b*, fl., × 2; *c*, long. sect. of corolla, × 2; *d*, calyx, × 2.

Locs.—North Coast Ranges and the rolling plains bordering their foothills on the Sacramento Valley side: Hartley sta., nw. Solano Co., *C. F. Baker* 2883; Martin ranch, South Fork Trinity River, *Jepson* 2016; Paskenta (6 mi. w.), sw. Tehama Co., *Virginia Bailey;* Dibble Creek, w. of Red Bluff, *Jepson* 20,928; Sims sta., Shasta Co., *Jepson* 20,922. Marysville Buttes: South Peak, *Jepson* 20,929. Sierra Nevada foothills and the rolling Great Valley plains immediately bordering them: Sycamore Gulch, Greenhorn Mts., *C. N. Smith* 315; Three Rivers (e. of), *W. Fry* 123; betw. Pinehurst and Badger, Fresno Co., *Newlon* 174; Ahwahnee, Madera Co., *Jepson* 12,827; Ruth Peirce Mine above Hornitos, Mariposa Co., *Jepson* 10,707; Snelling (5 mi. n.), Merced Co., *Hoover* 965; LaGrange, se. Stanislaus Co., *Jepson* 20,923; Harden ranch, s. Tuolumne Co., *Jepson* 10,559; Columbia, n. Tuolumne Co., *Jepson* 6392; Black Creek (5 mi. ne. of Copperopolis), Calaveras Co., *Tracy* 5632; Dry Creek hills, n. of Ione, Amador Co., *Jepson* 15,215; Placerville, *K. Brandegee;* Chico (plains e.), *R. M. Austin* 152; Oak Run, ne. Shasta Co., *Blankinship*.

Refs.—LINANTHUS FILIPES Greene, Pitt. 2:255 (1892); Jepson, Man. 803, fig. 777 (1925). *Gilia filipes* Benth., Pl. Hartw. 325 (1849), type loc. "Sacramento Valley" (the upper valley, east side; cf. Erythea 5:55), *Hartweg* 233. *G. liniflora* var. *filipes* Brand; Engler, Pflzr. 4^{250}:134 (1907). *L. pusillus* Mlkn., Univ. Cal. Publ. Bot. 2:49 (1904); Jepson, Fl. W. Mid. Cal. 430 (1901), ed. 2, 334 (1911); not L. pusillus Benth. *Gilia pusilla* var. *californica* Gray, Proc. Am. Acad. 8:263 (1870), based on G. filipes Benth.

14. **L. liniflorus** Greene. Stem erect, usually simple below, but freely and widely branched above, ½ to 1½ feet high, glabrous; leaf-blades palmately 3 to 7-divided into linear-filiform segments, minutely scaberulous, puberulent in the sinuses, 3 to 5 (or 10) lines long; flowers on long capillary pedicels in a dichotomously branched paniculate cyme, the pedicels mostly 4 to 14 lines long; calyx minutely puberulent to glabrate, narrow-campanulate to turbinate, 1¾ to 2½ lines long, its lobes oblong or lanceolate, ½ to as long as the tube; corolla short-funnelform, white or tinged with pink or lilac, 4 to 6 (or 8) lines long, the tube very short (½ to 1 line long), the throat about 1½ to 2 lines long; stamens inserted in or near base of corolla-throat, about ½ the length of the lobes; filaments pilose at very base or sometimes on lower part, the throat and tube usually puberulent at their insertion and below; capsule oval, the cells 2 to several-seeded; seeds mucilaginous when wetted.

Dry open ridges and sandy flats, 100 to 5000 feet: South Coast Ranges from San Francisco Co. to San Luis Obispo Co.; western Mohave Desert; cismontane Southern California from Santa Barbara Co. to San Diego Co.; Sacramento Valley (west side); San Joaquin Valley; southern Sierra Nevada in Kern Co.; Tehachapi Mts. Apr.-June.

Tax. note.—Linanthus liniflorus vs. Linanthus pharnaceoides. These two forms were first published under Gilia by George Bentham. The descriptive terms used by Bentham in the original diagnoses of Gilia liniflora and Gilia pharnaceoides (Bot. Reg. sub t. 1622), both collected by Douglas in "California," are exactly the same, save that in the former the corolla is described as thrice longer than the calyx, in the latter twice longer. In DeCandolle's Prodromus (9:315), Bentham adds that the throat is very pilose in G. liniflora and puberulent in G. pharnaceoides. Since the types were collected by Douglas in California it would seem that both forms must have been discovered in the coastal region, almost certainly in the South Coast Ranges, which were traversed by Douglas; but in such case the described differences, when applied to our California material, do not differentiate two distinct units. Corolla length in relation to calyx is unstable in this species group and often notoriously so in Polemoniaceae generally. Moreover, the presumed pubescence character is slight and obviously variable in different collections otherwise alike. On the basis of the known material such characters seem insufficient for use in separating two specific units in the region of the South Coast Ranges; and no other characters are available.

Locs.—South Coast Ranges: Potrero Hills, San Francisco (Zoe 2:364); Woodside, San Mateo Co., *C. F. Baker* 760; Mt. Hamilton, *Heller* 7438; Loma Prieta, Santa Cruz Mts., *Davy* 371; Cold Spr., Big Sur River, Monterey Co., *Jepson* 2598; Tassajara Hot Sprs., Santa Lucia Mts., *W. I. Follett* 76; San Miguelito rancho, near Jolon, Monterey Co., *Jepson* 1642; La Panza, cent. San Luis Obispo Co., *Summers;* Cuyama Valley, se. San Luis Obispo Co., *Hoffmann.* Western Mohave Desert: Willow Sprs., *Munz* 10,048. Cismontane S. Cal.: San Marcos Pass, Santa Ynez Mts., *Hoffmann* (puberulent calyces and glabrous calyces occur on one individual); Agua Caliente, Santa Ynez Mts., *A. L. Grant* 1681; Cow Cañon divide, San Gabriel Mts., *Peirson* 456; San Bernardino Mts., *Parish* 462; Beaumont, Riverside Co., *Jepson* 6076; San Jacinto River near San Jacinto, *Jepson* 1259; Hemet Valley, San Jacinto Mts., *C. V. Meyer* 765 (calyx glabrous); Trabuco Cañon, Santa Ana Mts. (Abrams, Fl. Los Ang. ed. 2, 292); Lakeside, San Diego Co., *K. Brandegee;* Descanso, San Diego Co., *Wolf* 2212. Great Valley, 10 to 500 feet (the usual plant is a slight form, var. vallicola Jepson, with the following features: pedicels ascending, or often divaricate and curved at tip, the flower thus erect; calyx usually glabrous; corolla-throat commonly with a puberulent or somewhat "frosty" zone at the stamen insertion near base of throat and below; filaments usually hairy at base): Willows, Glenn Co., *Jepson* 21,242; Main Prairie, e. Solano Co., *Jepson* 20,935 (in both Main Prairie and Willows spms. the filaments are inserted in upper part of corolla-throat, both the free and adherent parts glabrous); Byron, e. Contra Costa Co., *C. F. Baker* 2864; Deadman Creek, n. of El Nido, Merced Co., *Jepson* 17,480; Shafter, Kern Co., *Hoover* 942; Famoso, Kern Co., *Jepson* 12,415 (individuals with glabrous calyces and individuals with puberulent calyces occur in one narrow colony a few yards square, the plants plainly of one genetic constitution); Lerdo, Kern Co., *Jepson* 17,343. Southern Sierra Nevada in Kern Co.: Greenhorn Mts., *Allison Krames.* Tehachapi Mts.: Tehachapi, *K. Brandegee.*

Refs.—LINANTHUS LINIFLORUS Greene, Pitt. 2:254 (1892); Jepson, Fl. W. Mid. Cal. 430 (1901), ed. 2, 334 (1911), Man. 803 (1925). *Gilia liniflora* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas;* DC., Prodr. 9:315 (1845). *G. liniflora* subsp. *eu-liniflora* Brand; Engler, Pflzr. 4^{250}:133 (1907). *G. pharnaceoides* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas;* DC., Prodr. 9:315 (1845). *G. liniflora* var. *pharnaceoides* Gray, Proc. Am. Acad. 8:263 (1870). *Linanthus pharnaceoides* Greene, Pitt. 2:254 (1892); Jepson, Man. 803 (1925). *Gilia liniflora* subsp. *pharnaceoides* Brand; Engler, Pflzr. 4^{250}:133 (1907). Var. VALLICOLA Jepson, Man. 803 (1925), type loc. plain near Bakersfield, *Jepson* 8944.

15. **L. harknessii** Greene. Stem strictly erect, very slender, 3 to 10 inches high, branching mostly above the base and ending above in a dichotomously branched paniculate cyme; herbage sparsely puberulent to glabrate; leaf-blades palmately 3 to 5-parted into linear segments 1½ to 8 lines long; flowers minute, solitary on filiform pedicels, the pedicels 3 to 10 lines long; calyx cupshaped or turbinate, glabrous or nearly so, little shorter than the corolla, its lobes ⅓ to nearly as long as the calyx-tube; corolla funnelform, white, ¾ to 1½ lines long, glabrous; stamens inserted at the base of the corolla-throat, included in throat, glabrous; capsule ovoid, the cells 1-seeded.

Open places, usually in granitic soil, 3000 to 8000 feet: North Coast Ranges from northern Lake Co. to western Siskiyou Co.; Sierra Nevada from Fresno Co. to Modoc and Siskiyou Cos. North to Oregon. June.

Locs.—North Coast Ranges: Snow Mt., n. Lake Co., *T. Brandegee;* Soldier Ridge, Yollo Bolly Mts., *Jepson* 20,932; Grouse Mt., Humboldt Co., *Tracy* 12,832; Big Flat, Salmon Mts., *Hall* 8644; Shackelford Creek, w. Siskiyou Co., *Butler* 1657. Sierra Nevada: Jackass Mdw., South Fork San Joaquin River, *E. Ferguson* 447; Huntington Lake, Fresno Co., *Jepson* 12,982; Fallen Leaf Lake, Eldorado Co., *M. S. Baker;* Dog Valley, e. Nevada Co., *Jepson* 20,931; Summit sta., Nevada Co., *Jepson* 20,933; Webber Lake, Sierra Co., *Lemmon;* Jonesville, Butte Co., *Heller* 11,671; Meadow Valley, Plumas Co., *Jepson* 10,646; Feather Lake, sw. Lassen Co., *C. S. Robinson;* South Fork

Peak, Lassen Co., *Jepson* 7814; Forestdale, sw. Modoc Co., *M. S. Baker:* Big Bear Flat, se. Siskiyou Co., *Jepson* 20,115.

Var. **septentrionalis** (Mason) Jepson & Bailey comb. n. Corolla 1 to 2 lines long, the throat usually with a ring of fine pubescence at insertion of stamens; capsule-cells 2 to 5-seeded.—Mono Co. (betw. Mono Lake and Bridgeport, *Keck* 2914). East to Nevada and Wyoming, north to Montana, Idaho and eastern Oregon. Plants of var. septentrionalis from a wide range are uniform in character and are like Linanthus harknessii in habit, aspect, hue, leafage and inflorescence and essentially in flowers. The variety differs from the species most reliably in the number of seeds in the capsule.

Refs.—LINANTHUS HARKNESSII Greene, Pitt. 2:225 (1892); Jepson, Man. 803 (1925). *Gilia harknessii* Curran, Bull. Cal. Acad. 1:12 (1884), type loc. "summit of the Sierra Nevada," *H. W. Harkness;* (undoubtedly Summit sta., Nevada Co., since the point where the Overland Railroad crosses the Sierra Nevada summit at Donner Pass was commonly referred to thus in early days). Var. SEPTENTRIONALIS Jepson & Bailey. *L. septentrionalis* Mason, Madroño 4:159, pl. 28, figs. a–e (1938), type loc. Tower jct., Yellowstone Park, Wyo., *Mason* 3497 (typ. vidimus).

16. **L. rattanii** Greene. Stem simple and erect or diffusely branched, 2½ to 6 (rarely 12) inches high, puberulent, the hairs often gland-tipped; leaf-blades palmately 5-parted, 1 to 3 lines long, hirsutulose; flowers loosely cymose, the pedicels filiform, 5 to 10 lines long; calyx cylindric, ⅓ to ½ as long as the corolla, its lanceolate lobes ¼ to ⅓ as long as the calyx-tube; calyx-lobes equal, puberulent; corolla light or deep blue, tubular-funnelform, 5 to 9 lines long, the tube 2 times as long as calyx, usually puberulent outside, a ring of fine pubescence inside below the middle, the throat yellow; corolla-limb 4 to 6 lines wide; stamens exserted from the throat, glabrous, the filaments inserted on the middle or upper half of corolla-throat; style slightly exceeding anthers; capsule oblong, the cells several-seeded.

Open hillslopes, 1500 to 3500 feet: inner North Coast Range from Colusa Co. to northern Lake Co. May.

Locs.—Fouts Sprs., w. Colusa Co.; Summit Sprs., Snow Mt., n. Lake Co., *M. S. Baker* 3483.

Var. **ambiguus** (Rattan) Jepson comb. n. Corolla blue, the throat usually dark purple, the tube equaling to twice as long as the calyx.—Opens in wooded country, forming colonies, often on serpentine, 300 to 2500 feet: South Coast Ranges from Mt. Diablo and the east slope of the Santa Cruz Mts. south to San Benito Co.; Sierra Nevada foothills in Eldorado Co. The flowers close about 4 o'clock in the afternoon and open tardily the next morning. Apr.-May.

Locs.—Mt. Diablo, *Brewer* 1204; Crystal Springs Lake, San Mateo Co., *Elmer* 4913; Woodside, San Mateo Co., *C. F. Baker* 751; Redwood City, San Mateo Co., *Jepson* 5731; Mt. Day, ne. Santa Clara Co., *R. J. Smith;* Mt. Hamilton, *Jepson* 4196; Eva sta., Santa Cruz Mts., *Jepson* 20,918; Tulare Hill, Santa Clara Valley, *Jepson* 12,697; Cow Creek Cañon, w. Stanislaus Co., *Hoover* 4325; Panoche Pass, *Jepson* 18,120; Hernandez, s. San Benito Co., *Howell* 11,180. Eldorado Co.: betw. Salmon Falls and Simpson ranch, *K. Brandegee.*

Refs.—LINANTHUS RATTANII Greene, Pitt. 2:257 (1892). *Gilia rattanii* Gray, Syn. Fl. ed. 2, 2:407 (Jan., 1886), type loc. "mountain north of Clear Lake," *Rattan:* Jepson, Fl. W. Mid. Cal. 431 (1901), ed. 2, 335 (1911). Var. AMBIGUUS Jepson. *Gilia ambigua* Rattan, Bot. Gaz. 11:339 (Dec., 1886), type loc. Oak Hill near San Jose, *Rattan* (typ. in Herbario Jepsoniano). *Linanthus ambiguus* Greene, Pitt. 2:256 (1892); Jepson, Fl. W. Mid. Cal. 430 (1901), ed. 2, 335 (1911); Man. 804 (1925). *Gilia bolanderi* var. *ambigua* Brand; Engler, Pflzr. 4^{250}:135 (1907).

17. **L. bolanderi** Greene. Stem very slender, di- or tri-chotomously branched from the base and often diffuse, the branches with long filiform internodes, or the stem sometimes simple, 2 to 6 inches high, glabrous or puberulent, occasionally a little glandular above but very minutely so; blades palmately parted into 3 to 7 linear lobes, a little hirsutulose, 1 to 2 lines long; flowers cymose, the pedicels capillary, 2 to 9 (or 16) lines long; calyx puberulent to glabrate, narrowly cylindric, (2 or) 2½ to 3¼ lines long, 3-striate below the lobes, the membranous intervals beneath the sinuses very narrow and stopping short of the base, the lobes ⅙ to ⅓ as long as tube; corolla bluish, pink or purplish (perhaps rarely white), tubular-funnelform, 3 to 4 (or 6) lines long, its tube shorter than to 1¼ times as long as the calyx, glabrous outside, a ring of pubescence inside (or the hairs sparse or lacking), its limb 1½ to 2½ (or 3½) lines broad; stamens exserted from corolla-throat, the filaments inserted in throat below the sinuses or at middle of throat, glabrous; calyx in age turbinate-distended by the capsule; capsule oblong, the cells several-seeded; seeds showing spiricles when wetted.

Dry slopes, in chaparral or on outcropping ledges, 500 to 2900 feet: Coast Ranges from Contra Costa Co. to Siskiyou Co.; Sierra Nevada (mostly in the foothills) from Fresno Co. to Shasta Co. North to Washington. Apr.-June.

Locs.—South Coast Ranges: Mt. Diablo, *Bowerman* 2905; probably not on Mt. Hamilton (Univ. Cal. Publ. Bot. 2:51) or in San Benito Co. (Jepson, Man. 804). North Coast Ranges: Mt. Konocti (e. of), *Blankinship;* Indian Valley, ne. Lake Co., *M. S. Hazell;* Hullville, n. Lake Co., *Jepson* 20,919; Lodoga, w. Colusa Co., *Jepson* 16,269; Long Valley, Mendocino Co., *Tracy* 5803; Leggett Valley, nw. Mendocino Co., *Tracy* 5501; Paskenta (6 mi. w.), w. Tehama Co., *Virginia Bailey;* Crane Creek, w. Tehama Co., *Jepson* 20,921; Grasshopper Peak, South Fork Eel River, *Constance* 890; South Fork Mountain, Trinity Co., *Jepson* 16,672; Three Forks of Mad River, Trinity Co., *Tracy* 10,164; Oro Fino, Siskiyou Co., *Butler* 621. Sierra Nevada: Watts Valley (ridge w.), Fresno Co., *Hoover;* Hites Cove, Mariposa Co., *Congdon;* betw. Laynes ranch and Salmon Falls, Eldorado Co., *K. Brandegee;* Susanville, *Lemmon;* Red Bluff (rubble field ne.), *Jepson* 16,351.

Refs.—LINANTHUS BOLANDERI Greene, Pitt. 2:255 (1892); Jepson, Fl. W. Mid. Cal. 430 (1901), Man. 804 (1925). *Gilia bolanderi* Gray, Proc. Am. Acad. 8:263 (1870), type loc. "Sonoma Co." (in reality Ukiah, Mendocino Co.), *Bolander* 3830 (the true locality and number from label in Gray Herb.), (typ. vidi).

18. **L. pygmaeus** J. T. Howell. Stem slender or filiform, diffusely branched from the base or sometimes erect and branched above, 1¾ to 6 inches high; herbage minutely puberulent, the internodes rather long; leaf-blades palmately cleft into 4 or 5 filiform segments 2 to 2¼ lines long, the segments shortly hispidulose and hispidulose-ciliate; flowers on filiform pedicels in the forks or terminal, the pedicels 2 to 8 lines long; calyx cylindric, 2 to 2½ lines long, glabrous or rarely puberulent, its subulate teeth commonly closely erect (especially in bud), in age often spreading horizontally, about equaling the calyx-tube; calyx-tube usually 3-nerved beneath the lobes, in age slightly thickened or distended; corolla white, 1¼ to 2½ lines long, shorter than the calyx or only slightly exceeding it; corolla limb ¾ to 1 line broad; stamens exserted shortly from corolla-throat, the filaments inserted unequally about middle of throat, glabrous; capsule linear-oblong, the cells several-seeded.

In chaparral or on openly wooded slopes, 50 to 5000 feet: Butte Co.; North Coast Ranges from western Yolo Co. to Napa Co.; South Coast Ranges from Contra Costa Co. to southwestern Fresno Co.; Tehachapi Mts.; cismontane Southern California from the San Bernardino Valley to the Laguna Mts. South to Guadalupe Isl., Lower California. Apr.-May.

Locs.—Butte Co.: plains near the Sierra Nevada foothills e. of Chico, *R. M. Austin* 168. North Coast Ranges: Rumsey (hills n.), Yolo Co., *Hoover* 3191; Kelseyville, Lake Co., *Eastwood & Howell* 5734; Howell Mt., Napa Range, *Tracy* 1502; Conn Valley, Napa Range, *Jepson* 20,920. South Coast Ranges: Antioch, *T. Brandegee;* Stanford, *C. F. Baker* 680; Mt. Hamilton, *J. T. Howell* 4661; Pacific Grove, *Heller* 6796; Milpitas Creek, Santa Lucia Mts., *Eastwood & Howell* 2401; Hernandez, s. San Benito Co., *Eastwood;* Priest Valley, se. Monterey Co., *Eastwood:* Alcalde, sw. Fresno Co., *Eastwood.* Tehachapi Mts.: Tehachapi, *T. Brandegee.* Cismontane S. Cal.: Santa Ana Hills, San Bernardino Valley, *Parish* 1413; Laguna Lake, Laguna Mts., *Peirson* 5924.

Refs.—LINANTHUS PYGMAEUS Howell, Lflts. W. Bot. 2:100 (1938). *Gilia pygmaea* Brand; Engler, Pflzr. 4^{250}:134 (1907), type loc. Guadalupe Isl., L. Cal., *Palmer* 79. *L. pusillus* Jepson, Fl. W. Mid. Cal. 430 (1901); not Gilia pusilla Benth., Bot. Reg. sub t. 1622 (1833), type loc. La Punta de Cortes, Chile, *Bertero.*

19. **L. grandiflorus** Greene. Stem simple, erect, 3 to 10 (or 14) inches high, glabrous or glabrate; leaf-blades palmately parted into narrowly linear lobes, 7½ to 12½ lines long, puberulent to glabrous; flowers few to several in dense terminal heads or rarely 1 or 2 in the subterminal axils; bracts villous-ciliate; calyx villous, its tube scarious to base below the sinuses, its lobes a little shorter than the tube; corolla funnelform, pure white, aging lilac or pink, 7½ to 12½ lines long, the throat long-tapering, about equaling the tube; stamens inserted near the base of the throat, equaling the throat; style exserted a little from throat; capsule-cells 1 to 5-seeded.

Openly wooded grassy hill slopes or sandy valley flats, 20 to 2600 feet: Marin Co. and western Alameda Co. to northern Santa Barbara Co. May-June.

Locs.—Pt. Reyes, Marin Co., *Keck* 4574; San Francisco (Zoe 2:364); Alameda, *Bolander;* Mt. Hamilton, *Jepson* 4230; Pacheco Pass, w. Merced Co., *Hoover* 3285; Greeninger Creek, w. of Gilroy, *Jepson* 9696; Soquel Cañon, Santa Cruz Mts., *Jepson* 20,934; Monterey Co. (Jepson, Man. 804); Los Alamos Valley, n. Santa Barbara Co., *Jepson* 20,265.

Refs.—LINANTHUS GRANDIFLORUS Greene, Pitt. 2:260 (1892); Jepson, Man. 804 (1925); Tansey, J. W., Addisonia 20:57, pl. 669 (1939). *Leptosiphon grandiflorus* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas. Gilia grandiflora* Steud., Nom. Bot. 1:683 (1840). *Leptosiphon densiflorus* Benth., l.c., type from Cal., *Douglas. Gilia densiflora* Benth.; DC., Prodr. 9:316 (1845). *Linanthus densiflorus* Jepson, Fl. W. Mid. Cal. 431 (1901); ed. 2, 335 (1911). *Gilia leptosiphon* Steud., Nom. Bot. ed. 2, 1:684 (1840), based on Leptosiphon densiflorus Benth.

20. **L. orcuttii** (Parry & Gray) Jepson. Stem branched from the base, 3 to 6 inches high; herbage thinly puberulent; leaf-blades palmately parted, 1½ to 3 lines long; flowers in terminal capitate clusters, sometimes in small clusters in the axils or solitary in the forks; calyx deeply cleft, the lobes membranous-margined, 3 to 4 times as long as the tube, the tube membranous to base below the sinuses; corolla funnelform, pink-white, 8 to 12 lines long, the tube equaling the calyx, the throat ⅓ to ½ as long as the tube; filaments inserted on the base of the corolla-throat and as long, the anthers barely exserted from the throat; style exceeding the stamens; capsule oblong, the seeds small.

Opens on brushy or wooded hillslopes, 3000 to 3500 feet: Palomar Mt., San Diego Co. South to northern Lower California. May-June.

Field note.—Linanthus orcuttii occurs locally on the northerly slope of Palomar Mt., in the mountain valley called Cootca, where it is a showy annual in the latter part of May and early June. It also occurs elsewhere on that mountain. Other stations in California are not known to us.

Refs.—LINANTHUS ORCUTTII Jepson, Man. 804 (1925). *Gilia orcuttii* Parry & Gray, Proc. Davenport Acad. 4:40 (1883), type from L. Cal., *Orcutt. L. pacificus* Mlkn., Univ. Cal. Publ. Bot. 2:53 (1904), type loc. Cootca, Palomar Mt., San Diego Co., *Jepson* 1523 (typ. in Herbario Jepsoniano) and *Hall* 1954. *Gilia pacifica* Brand; Engler, Pflzr. 4^{250}:134 (1907).

21. **L. serrulatus** Greene. Stem erect, simple or branched, 4 to 8 inches high, puberulent; leaves in few whorls, the blades palmately 5 to 7-parted into linear lobes, the lobes spinulose-ciliate; flowers capitately and terminally congested, occasionally a few flowers in the axils of the branches; calyx mostly chartaceous, not at all or only slightly membranous below the sinuses, its lanceolate or subulate lobes 2 to 4 times as long as the calyx-tube; corolla salverform, white to cream-color, the tube purple, 3 to 5 lines long, pilose-puberulent, the throat yellow, often with black markings at base; corolla-lobes 2½ to 4 lines long; filaments inserted about middle of corolla-throat, the anthers barely exserted from the throat; style exceeding the anthers; capsule-cells 1 to 3-seeded.

Mountain valleys and cañon slopes, 2000 to 4000 feet: Sierra Nevada from Mariposa Co. to Kern Co. June.

Field note.—Linanthus serrulatus has been little collected and is known but from few stations: Mariposa, *Congdon;* Coarsegold, Madera Co., *Benson* 3582; Big Creek, Fresno Co., *I. T. Walker;* Eshom Valley, Tulare Co., *Jepson* 2807; Bear Creek, Tulare Co., *Purpus* 1737; Laver's Mdw., Greenhorn Mts., *Kromes.* It is closely allied to and perhaps no more than varietally separable from Linanthus androsaceus.

Refs.—LINANTHUS SERRULATUS Greene, Erythea 3:120 (1895), type loc. "near Madera" (most likely in the Sierra Nevada foothills eastward), *Buckminster;* Jepson, Man. 804 (1925). *Gilia androsacea* subsp. *serrulata* Brand; Engler, Pflzr. 4^{250}:142 (1907). *L. mariposanus* Mlkn., Univ. Cal. Publ. Bot. 2:57 (1904), type loc. below Mariposa, Mariposa Co., *Congdon. Gilia mariposana* Brand; Engler, Pflzr. 4^{250}:137 (1907).

22. **L. androsaceus** Greene. SHOWER GILIA. (Fig. 391.) Stem simple or branched from the base, 3 to 14 inches high, puberulent; leaf-blades palmately divided into oblanceolate or linear lobes, commonly ciliate or sometimes puberulent, 2 to 12 lines long; flowers in dense heads; bracts few to many; calyx herbaceous, coarsely hairy to glabrous, cleft nearly to base into subulate lobes, not at all membranous or only slightly below the sinuses; corolla salverform, white, pink, crimson, lavender or yellow, the throat purple or dark brown, the tube 6 to 13 (or 16) lines

long, 3 to 6 times as long as the calyx, often yellow or darker in color than the corolla-lobes; corolla-lobes broadly obovate to oblong, 3 to 5 lines long; stamens inserted about middle of corolla-throat, little surpassing the throat; capsule-cells about 3 to 6-seeded.

Open hillslopes and valleys, 50 to 3500 feet: Shasta Co.; Coast Ranges from Humboldt Co. to Monterey Co.; Orange Co. Apr.-June. It is very variable as to size and color of corolla and not well differentiated from L. parviflorus.

Locs.—Shasta Co.: Furnaceville, *M. S. Baker;* Millville, *M. S. Baker.* Coast Ranges: Yager Creek, Humboldt Co., *M. S. Baker* 45; Larrabee Valley, Humboldt Co., *Tracy* 16,553; Upper Look Prairie, Bull Creek, Humboldt Co., *Constance* 723; Mail Ridge, Humboldt Co., *Jepson* 1884; Cahto School, cent. Mendocino Co., *Jepson* 1855; Putah Creek (bluffs of), w. of Winters, *Jepson* 20,905; Signal sta., Vaca Mts., *Jepson* 20,904; Howell Mt., Napa Co., *E. Ferguson* 352; Bodega, Sonoma Co., *Ewan* 9200; Ross Valley, Marin Co., *Jepson* 20,901; San Francisco, *Jepson* 2634; Berkeley Hills, *Jepson* 20,902; Fish Ranch, w. Contra Costa Co., *Jepson* 20,906; Corral Hollow, Mt. Hamilton Range, *May Arnold;* Pescadero, San Mateo Co., *A. L. Grant* 936; Mt. Hamilton, *Jepson* 4208; Pacific Grove, *Tidestrom.* Orange Co.: Trabuco Cañon, Santa Ana Mts., *A. J. Perkins.*

Refs.—LINANTHUS ANDROSACEUS Greene, Pitt. 2:258 (1892); Jepson, Fl. W. Mid. Cal. 431 (1901), ed. 2, 335 (1911), Man. 805, fig. 778 (1925). *Leptosiphon androsaceus* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas.* *Gilia androsacea* Steud., Nom. Bot. ed. 2, 1:683 (1840). *G. androsacea* subsp. *eu-androsacea* Brand; Engler, Pflzr. 4^{250}:141 (1907). *G. longituba* Benth., Pl. Hartw. 324 (1849), type loc. in woods near Monterey, *Hartweg* 11. *G. micrantha* var. *longituba* Gray, Syn. Fl. 2:139 (1878). *Linanthus longitubus* Hel., Muhl. 1:43 (1901). *Gilia longituba* subsp. *eu-longituba* Brand; Engler, Pflzr. 4^{250}:140 (1907). *G. androsacea* var. *detonsa* Gray, Proc. Am. Acad. 8:266 (1870), type from Cal., *Bridges;* also in "mts. of Monterey Co." (Bot. Cal. 1:491). *Leptosiphon parviflorus* var. *rosaceus* Hook., Bot. Mag. t. 5863 (1870), type cultivated in England, "native of Cal." *Gilia androsacea* var. *rosacea* Gray, Bot. Cal. 1:491 (1880). *Linanthus rosaceus* Greene, Pitt. 2:259 (1892), "San Francisco peninsula." *Linanthus parviflorus* var. *rosaceus* Jepson, Fl. W. Mid. Cal. 431 (1901), ed. 2, 336 (1911), Man. 805 (1925), based on *Linanthus rosaceus* Greene. *Gilia longituba* var. *rosacea* Brand; Engler, Pflzr. 4^{250}:140 (1907). *Linanthus roseus* Thomps., Gard. 31:1264 (1871), type from Cal. *Gilia lutea rosea* Regel, Gartenfl. 20:97, t. 682 (1871). *Linanthus croceus* Eastw., Bot. Gaz. 37:442 (1904), type loc. near Pt. San Pedro, San Mateo Co., *Eastwood* (typ. vidi). *Linanthus parviflorus* var. *croceus* Mlkn., Univ. Cal. Publ. Bot. 2:59 (1904), type loc. betw. Colma and Blenheim, San Mateo Co., *Eastwood.* *Gilia rosacea* subsp. *crocea* Brand; Engler, Pflzr. 4^{250}:141 (1907). *Linanthus androsaceus* var. *croceus* Jepson, Man. 805 (1925).

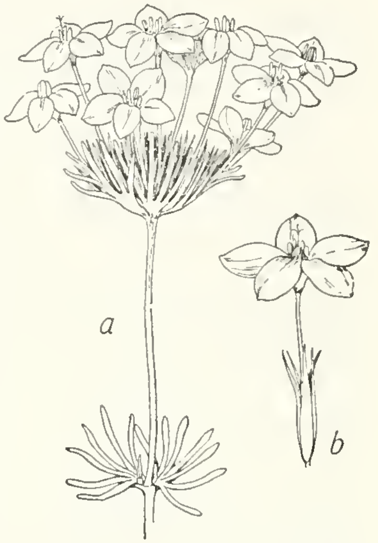

Fig. 391. LINANTHUS ANDROSACEUS Greene. *a*, upper part of flowering stem, × 1; *b*, fl., × 1½.

23. **L. parviflorus** Greene. Stem simple and erect, or diffusely branched from the base, 3 to 6 or 11 inches high; herbage subglabrous to puberulent; leaf-blades palmately 3 to 7-parted, the lobes spatulate or oblanceolate to linear, 2½ to 6 lines long; bracts finely puberulent or hirsutulous, commonly 3 to 4 lines long; flowers capitately congested; calyx puberulent, ⅕ to ⅓ as long as corolla-tube, its lobes slender-lanceolate, about 1 to 4 times as long as calyx-tube, the tube not scarious below the sinuses; corolla purple, pinkish, white, pale yellow or golden, ¾ to 1½ inches long, the lobes oval, 1½ to 2½ (or 3) lines long, tinged with red or brown on the outside, the throat yellow; corolla-tube puberulent to glabrous, often microscopically glandular; stamens half or commonly more than half as long as corolla-lobes, inserted in lower part of corolla-throat; cells of the capsule several-seeded.

Open ground or open woodlands in the hill country, 200 to 3000 (or 5000) feet, a very abundant species: Coast Ranges from Tehama Co. to San Luis Obispo Co.;

Sierra Nevada foothills from Butte Co. to Eldorado Co. and also in Kern Co.; south to coastal southern California as far as San Diego Co. Mar.-May.

Locs.—Coast Ranges: Ely, sw. Tehama Co., *Jepson* 16,334; Redwood Valley, cent. Mendocino Co., *Tracy* 16,541; Bartlett Mt., n. Lake Co., *M. S. Hazell;* Little Cow Mt., w. Lake Co., *M. S. Hazell;* Calistoga (sw. of), *Jepson* 20,940; Conn Valley, Napa Range, *Jepson* 6255; Graveyard Hill, Vacaville, *Jepson* 20,937; Wright School, Sebastopol, Sonoma Co., *Ewan* 9258; Bracken Brae, Boulder Creek, Santa Cruz Co., *V. F. Hesse* 117a; near Point Lobos, Carmel River, *E. Ferguson* 312; Chews Ridge, Santa Lucia Mts., *Follett* 74; Lewis Creek, s. San Benito Co., *Jepson* 16,151a; Stone Cañon, se. Monterey Co., *Jepson* 12,036; Cantua Creek, n. of Coalinga, *Jepson* 17,010; Zapato Chino Creek, sw. Fresno Co., *Jepson* 15,367; Kettleman Hills, near Avenal, *Hoover* 3323; Carrizo Plain, se. San Luis Obispo Co., *Condit.* Sierra Nevada foothills: Table Mt., 8 mi. n. of Oroville, *Heller* 11,258; Salmon Falls, Eldorado Co., *Jepson* 15,750; Jack ranch (2 mi. n.), White River, Tulare Co., *C. N. Smith* 510; Howling Gulch, near Woody, Kern Co., *C. N. Smith* 337. Coastal S. Cal.: Buckhorn Cañon, n. Santa Barbara Co., *H. & M. Dearing* 1407; Zaca Lake, San Rafael Mts., *Hoffmann;* Knapps Lodge, Santa Ynez Mts., *Hoffmann;* Santa Cruz Isl., *T. Brandegee;* Ojai Valley, Ventura Co., *Thacher* 36; Bouquet Cañon, n. Los Angeles Co., *Clokey* 4765; Pacoima Cañon, San Gabriel Mts., *Peirson* 377; San Bernardino foothills, *Parish;* Santa Ana, Orange Co., *Alice King;* Palomar Mt., *Jepson* 1491; Escondido, San Diego Co., *C. V. Meyer* 92; Descanso, San Diego Co., *Wolf* 2200.

Refs.—LINANTHUS PARVIFLORUS Greene, Pitt. 2:258 (1892); Jepson, Fl. W. Mid. Cal. 431 (1901), ed. 2, 335 (1911), Man. 805 (1925). *Leptosiphon parviflorus* Benth., Bot. Reg. sub t. 1622 (1833), type from Cal., *Douglas. Leptosiphon luteus* Benth., l.c., type from Cal., *Douglas;* (this name, Leptosiphon luteus Benth., Bot. Reg. sub t. 1622, precedes Leptosiphon parviflorus Benth., Bot. Reg. sub t. 1622, on the page, but Greene, Pitt. 2:258, definitely chose the name Leptosiphon parviflorus for use as the basis of his Linanthus parviflorus because of certainty attending it, at the same time placing a query on Leptosiphon luteus as a synonym because of uncertain identity. Under the International Rules, Linanthus parviflorus Greene is, therefore, valid). *Gilia lutea* Steud., Nom. Bot. ed. 2, 1:684 (1840). *Gilia micrantha* Steud., l.c.; Benth. in DC., Prodr. 9:315 (1845), type from Cal., *Douglas. G. lutea* subsp. *micrantha* Brand; Engler, Pflzr. 4^{250}:142 (1907). *G. micrantha* var. *aurea* Benth., Pl. Hartw. 325 (1849), type loc. Sacramento Valley, *Hartweg* 234. *Linanthus nudatus* Greene, Erythea 3:120 (1895), type from Lake Co., agrees (ex char.) sufficiently well with *Linanthus parviflorus* as here understood, save that the calyces are described as "scarious between the angles." *Linanthus breviculus* var. *nudatus* Mason; Jepson, Man. 806 (1925), the varietal name resting on L. nudatus Greene, a Lake Co. plant. *Linanthus luteolus* Greene, Erythea 3:121 (1895), type loc. Cuyamaca Mts., *Vasey;* belongs here acc. S. B. Parish in litt. and essentially ex char. *Linanthus parviflorus* var. *luteolus* Mlkn., Univ. Cal. Publ. Bot. 2:58 (1904). *Gilia lutea* var. *luteola* Brand; Engler, Pflzr. 4^{250}:143 (1907), probably belongs here. *Linanthus asprellus* Greene in Baker, West Am. Plants 2:13 (1903), nomen nudum, type from "Mid. W. Cal.," *Baker* 3064, perhaps belongs here. *Linanthus graciosus* Mlkn., Univ. Cal. Publ. Bot. 2:59 (1904), type loc. La Graciosa, Santa Barbara Co., *Eastwood* (typ. vidi); bracts ½ as long as calyces; calyces rather densely puberulent with spreading or reflexed hairs. *Linanthus plaskettii* Eastw., Bot. Gaz. 37:443 (1904), type loc. Santa Lucia Mts., *Plaskett* 90; here referred on the basis of a collection named L. plaskettii by the author of the species. *Gilia exigua* Brand, l.c. 139, type loc. Lake Co., *Brandegee* (typ. vidi). *Gilia tassajarae* Brand; Engler, Pflzr. 4^{250}:140 (1907), type loc. Tassajara Hot Sprs., Santa Lucia Mts., *Elmer* 3255. *G. lutea* var. *longistylis* Munz, Man. 599 (1935), type loc. San Diego, *C. F. Baker* 1608; style exserted.

24. **L. bicolor** Greene. Stems one and simple, or several and ascending from the base, 1 to 4 (or 7) inches high, puberulent; very near L. parviflorus but reduced or dwarf; leaf-blades palmately divided into linear segments, 2 to 4 lines long, these and the bracts puberulent and hispid-ciliate; flower-clusters often densely bracteate; calyx hispid or hispidulous, 3½ to 3¾ lines long, cleft ⅔ or nearly to base, its lobes subulate, 2 to 4 times as long as the tube, the intervals not scarious; corolla purple or pink (or sometimes white or cream-color turning lavender) with yellow throat, or golden, 7 to 15 lines long, its lobes very short (1 to 1½ lines long) in proportion to the tube which is 6 to 12 lines long; stamens inserted between middle and base of corolla-throat, about ½ to ¾ as long as the corolla-lobes; capsule cells few (2 to 4)-seeded.

Open grassy or thinly wooded hills or gravelly flats, 300 to 3500 (or 5000) feet: coastal Southern California from Los Angeles Co. to Santa Barbara Co.; Coast Ranges from western Fresno Co. to Humboldt Co.; Tehachapi Mts.; Sierra Nevada foothills from Kern Co. to Plumas Co. North to Vancouver Isl. Apr.-May.

Distrib. note.—Though Linanthus bicolor is so widely distributed in the foothills in cismontane California it seems infrequent in individuals, perhaps in part because of its inconspicuous character and in part because often masked by luxuriant growth on grass lands. Occasionally it is notably gregarious. Along the South Fork American River near Salmon Falls in Eldorado County, the opens of the thinly wooded slopes, carrying only a few scattered oaks, are frequently pale or pink-creamy in April with its broad colonies. It is also common throughout all the low openly oak-wooded hill country of Cottonwood Creek and its tributaries in western Tehama County. In this region it apparently replaces Linanthus parviflorus which is so common on the hills in west central California. The calyx in Linanthus bicolor is usually hispid or hirsute, the corolla is glabrous or sometimes microscopically glandular-puberulent.

Locs.—Coastal S. Cal.: Wilson Peak, San Gabriel Mts. (Abrams, Fl. Los Ang. ed. 2, 293); San Clemente Isl., *Murbarger* 21; Santa Catalina Isl. (Millsp. & Nutt., Fl. Santa Catalina Isl., 214); Santa Barbara (Dav. & Mox., Fl. S. Cal. 293). Coast Ranges: Zapato Chino Cañon, *Jepson* 15,383; upper Waltham Creek, sw. Fresno Co., *Jepson* 16,155; Rattlesnake Butte, Mt. Hamilton Range, *Wilson* 612; Mt. Diablo, *Bowerman* 625; Conn Valley, Napa Range, *Jepson* 10,315; Callayomi Valley, s. Lake Co., *Jepson* 17,417; Lakeport, *Tracy* 5514; Willits, Mendocino Co., *Jepson* 2496; Sherwood Valley, Mendocino Co., *Jepson* 1832; Upper Look Prairie, Bull Creek, Humboldt Co., *Constance* 816; Paskenta, w. Tehama Co., *Virginia Bailey;* Willow Creek, Trinity River Valley, *Tracy* 15,287; Hupa Mt., n. Humboldt Co., *Tracy* 12,576. Tehachapi Mts.: Rowen, *Jepson* 6711. Sierra Nevada foothills: Kern River Park, *Krames;* Kaweah, Tulare Co., *W. Fry* 113; Big Creek, Fresno Co., *I. T. Walker;* Fresno Flats, Madera Co., *Jepson* 12,844; betw. Warnerville and Oakdale, Stanislaus Co., *Jepson* 18,101; Chinese Camp, Tuolumne Co., *Jepson* 18,066; Italian Bar, South Fork Stanislaus River, *A. L. Grant* 6a; Avery (3 mi. w.), Calaveras Co., *Tracy* 5723; Salmon Falls, Eldorado Co., *Jepson* 15,751; Cherry Gulch, Plumas Co., acc. *W. I. Follett.*

Refs.—LINANTHUS BICOLOR Greene, Pitt. 2:260 (1892); Jepson, Fl. W. Mid. Cal. 432 (1901), ed. 2, 336 (1911), Man. 805 (1925). *Leptosiphon bicolor* Nutt., Proc. Acad. Phila. 4:11 (1848), type loc. "on the Oregon [that is, the Columbia River] near the outlet of the Wahlamet" [River], *Gambel. Gilia tenella* Benth., Pl. Hartw. 325 (1849), type loc. Sacramento Valley (more exactly, near the junction of the Feather and Yuba rivers; cf. Erythea 5:55), *Hartweg* 228. *L. acicularis* Greene, Pitt. 2:259 (1892), type from Cal.; Jepson, Fl. W. Mid. Cal. 432 (1901), ed. 2, 336 (1911), Man. 805 (1925). *L. eastwoodae* Hel., Muhl. 1:126 (1905), type loc. Clear Creek, Butte Co., *Heller. Gilia eastwoodae* Brand; Engler, Pflzr. 4^{250}:139 (1907), type loc. "Madera," *Buckminster* (the first-cited locality); Zaca Mts., Santa Barbara Co., *Eastwood*, also cited. *Gilia exigua* Brand, l.c., type loc. Lake Co., *T. Brandegee;* folia plerumque tripartita, segmento intermedio oblanceolato, lateralibus linearibus (ex char.).

25. **L. ciliatus** Greene. Stem simple or branched, somewhat rigid, 4 to 5 (rarely to 12 or 17) inches high; herbage finely puberulent; leaves palmately parted into linear lobes, ciliate, 2 to 6 (rarely 9) lines long; flowers capitately congested; bracts ciliate; calyx cleft half-way or a little more, membranous to base below the sinuses, ½ to as long as corolla-tube, its lobes acerose; corolla deep rose-red, pink or purple (the throat yellow), salverform, 6 to 9 lines long, only slightly exceeding the bracts, the lobes elliptic or oblong, often with a purple spot, 1 to 1½ lines long; stamens inserted about middle of corolla-throat, about ½ as long as the corolla-lobes; capsule-cells 1 or 2-seeded.

Openly wooded hills and mountain slopes, 300 to 8000 feet: inner and middle Coast Ranges from western Siskiyou Co. to San Luis Obispo Co.; Marysville Buttes; Sierra Nevada from Tehama and Lassen Cos. to Tulare Co.; coastal Southern California from Santa Barbara Co. to San Diego Co. Apr.-May.

Locs.—Coast Ranges: Highland Mine, w. Siskiyou Co., *Butler* 944; Sisson, *Jepson* 20,916; Hennessey road, South Fork Trinity River, *Tracy* 6995; Grouse Mt., Humboldt Co., *Tracy* 12,923; Rockville, w. Glenn Co., *Jepson* 16,303; Indian Valley, ne. Lake Co., *M. S. Hozell;* Putah Creek (s. bank), above Winters, *Jepson* 20,913; Weldon Cañon, Vaca Mts., *Jepson* 20,908; Rutherford (hills w.), Napa Co., *Jepson* 20,909; Mt. Diablo, *Bowerman* 3042; Pozo (7 mi. se.), San Luis Obispo Co., *Hendrix* 179. Marysville Buttes: South Peak, *Jepson* 20,914. Sierra Nevada: Battle Creek Mdw., e. Tehama Co., *J. Grinnell;* Long Valley (mts. w.), se. Lassen Co., *Hanks* 90; Bear Valley, Nevada Co., *Jepson* 20, 912; Alder Creek near Folsom, Sacramento Co., *Alice King;* Silver Valley, Alpine Co., *Jepson* 10,094; Gwin Mine, Calaveras Co., *Jepson* 1793 (an excellent match in size, habit, pubescence and flowers for *Hartweg* 268, the type.—Kew Herbarium, 1906, W. L. J.); Calaveras Grove, *A. L. Grant;* Duck Bar, Stanislaus River, *A. L. Grant* 724; Hetch-Hetchy, *A. L. Grant* 866; Hodgdon ranch, s. Tuolumne Co., *Jepson* 10,521; Owens Creek, w. Mariposa Co., *Jepson* 12,759; Fresno Grove, *Jepson* 15,995; Rogers Valley, n. of Auberry, Fresno Co., *Jepson* 12,896; Huntington Lake, *Jepson* 12,983; Mono Mdws., South Fork San Joaquin River, *E. Ferguson* 417; Cahoon Mdw., w. of Mt. Silliman, *Jepson* 721; Alta Mdws., Tulare Co., *Newlon* 39.

S. Cal.: Big Pine Mt., San Rafael Mts., *Hoffmann;* North Fork San Antonio Cañon, San Gabriel Mts., *Peirson* 455; San Bernardino Mts., *Parish;* Strawberry Valley, San Jacinto Mts. (Univ. Cal. Publ. Bot. 1:103); San Diego Co. (Univ. Cal. Publ. Bot. 2:62).

Var. **neglectus** (Greene) Jepson. Stem simple, very slender, 1 to 2 inches high; corolla-lobes pink, the throat yellow, the yellow extending into the base of the lobes and bearing a crimson spot.—Montane slopes, Sierra Nevada, 6800 to 9000 feet, from Alpine Co. to Mariposa Co.: Carson Pass, *Yates* 3945; McClure Fork Merced River, *Jepson* 4429c.

Refs.—LINANTHUS CILIATUS Greene, Pitt. 2:260 (1892); Jepson, Fl. W. Mid. Cal. 432 (1901) ed. 2, 336 (1911), Man. 805 (1925). *Gilia ciliata* Benth., Pl. Hartw. 325 (1849), type loc. Sacramento Valley, *Hartweg* 268. Var. NEGLECTUS Jepson, Man. 806 (1925). *L. neglectus* Greene, Erythea, 3:24 (1895), type from the Sierra Nevada.

26. **L. montanus** Greene. MUSTANG CLOVER. Stem commonly simple, erect, 4 to 22 inches high, coarsely pubescent near the base, puberulent above; internodes usually long; leaf-blades palmately 5 to 7-parted into oblanceolate or linear lobes, 3 to 15 lines long, hispid or hispidulose; flowers capitately congested; bracts densely and coarsely bristly-ciliate; calyx membranous to base below sinuses, about ⅓ as long as corolla-tube; calyx-lobes subulate, about as long as calyx-tube; corolla long-salverform, white or pink-red with a purple spot toward the base of the lobes, 1 to 1½ inches long, the tube 10 to 14 lines long, pubescent, the throat yellow, short, the lobes 2½ to 3½ lines long; stamens inserted about the middle of corolla-throat (often one shorter and inserted lower than the rest), the anthers crowded at mouth of throat or exserted at most to about ¼ length of corolla-lobes; capsule-cells 1 or 2-seeded.

Openly wooded slopes or open gravelly flats, 1100 to 5000 feet: Sierra Nevada from Nevada Co. to Kern Co.; San Bernardino Mts. Apr.-May.

Field note.—Linanthus montanus forms marked colonies in the open foothill woodlands of Quercus wislizenii and Pinus sabiniana, or at higher altitudes in woodlands of Pinus ponderosa, Pinus lambertiana and Abies concolor—colonies so strikingly beautiful for delicacy and coloration that this species may be regarded as the handsomest of the Linanthi. While there is some variation in color, the color areas and markings are very constant. Technically, the species is somewhat indefinitely differentiated from Linanthus androsaceus and has been reduced to a subspecies of the latter by Brand. However, the calyx is membranous to the base below the sinuses in Linanthus montanus, while it is usually not membranous in Linanthus androsaceus. It is of some significance, also, to note that Linanthus montanus occupies a unified geographic area from which Linanthus androsaceus is quite absent.

Locs.—Nevada Co., acc. to *Greene;* Bisbee Peak, Amador Co., *Nordstrom* 743; Gwin Mine, Calaveras Co., *Jepson* 1806; Pine Log sta., South Fork Stanislaus River, Tuolumne Co., *A. L. Grant* 706; Lookout Mt., Mariposa Co., *Schlobohm* 132; Big Creek, Fresno Co., *I. T. Walker;* Rogers Valley (n. of Auberry), Fresno Co., *Jepson* 12,899; betw. Squaw Valley and Dunlap, s. Fresno Co., *Jepson* 2752; betw. Oak Flat and Badger, Tulare Co., *H. P. Kelley;* betw. Colony Mill and Marble Fork, Tulare Co., *Jepson* 665; Democrat Sprs., lower Kern River, Greenhorn Mts., *Jepson* 19,894. San Bernardino Mts.: Bear Valley, acc. *P. A. Munz.*

Refs.—LINANTHUS MONTANUS Greene, Erythea 3:120 (1895), "Sierra Nevada from Nevada Co. southward to the San Bernardino Mts."; Jepson, Man. 806 (1925). *L. ciliatus* var. *montanus* Greene, Pitt. 2:260 (1892), type from the "Sierra Nevada at higher than middle elevations." *Gilia androsacea* subsp. *montana* Brand; Engler, Pflzr. 4^{250}:141 (1907). *G. ciliata* var. *montana* Munz, Man. 398 (1935).

27. **L. breviculus** Greene. Stem simple or much branched from the base, puberulent or glabrate, 4 to 12 inches high; leaf-blades palmately divided into 3 to 5 linear lobes, finely pilose, 1 to 5 lines long; leaf-whorls on lower part of stems usually crowded (often concealing the stem), 1 to 2 lines long, the lobes blunt; flowers capitately congested in small clusters at the summit of the stem or ends of the branches and usually also in sessile or subsessile clusters in the uppermost forks, or a small cluster or a single flower proliferous from a terminal cluster; bracts few; calyx hirsutulose, its lobes lanceolate, ⅓ to ½ as long as the tube, its intervals membranous and of equal width to the base below the sinuses; corolla salverform, white to purple or lavender-crimson, 7½ to 15 lines long, the limb 5 to 7½ lines broad, the tube 2 to 3 times as long as the calyx; tube and lower portion of the throat dark blue or purple; stamens inserted near the middle to the base of the corolla-throat; style exceeding the anthers; capsule-cells several (6 to 12)-seeded.

Open or brushy mountain slopes or flats or on mesas, 1300 to 7000 feet: central Mohave Desert; San Bernardino Mts. and both its bordering cismontane and transmontane foothills and mesas. Apr.-July.

Geog. note.—The center of distribution of Linanthus breviculus lies in the Mohave Desert in those desert ranges extending from Ord Mountain westerly towards Stoddard Well. Although hitherto not known in the desert, it occurs in greatest abundance (and in definite patterns) in this montane portion of the desert. South of Barstow about three miles it is a dominant in April and colors the broad washes in colonies from four to five miles long (*Jepson* 20,363). Similarly, on the slopes north of Ord Mountain, it is abundant for miles in years of above average precipitation and in various areas "covers the ground like a delicate lavender mist" (upper Ord road, *Mary Beal* 780). In the region southward the following stations in the San Bernardino Mountains and their near borders are cited: Cajon Pass, *Jepson* 6120; Horsethief Cañon, *Clokey & Anderson* 6826; Seeleys Flat, *Parish;* Arrowhead Lake, *Braunton* 1061; San Bernardino Valley, *Jepson* 5536.

Refs.—LINANTHUS BREVICULUS Greene, Pitt. 2:259 (1892); Jepson, Man. 806 (1925). *Gilia brevicula* Gray, Proc. Am. Acad. 12:79 (1876), type loc. "Mohave River" (that is, on its headwaters, north slope San Bernardino Mts.), *Palmer. L. androsaceus* var. *breviculus* Mlkn., Univ. Cal. Publ. Bot. 2:57 (1904). (?) *Gilia royalis* Brand, Ann. Conserv. et Jard. Bot. Genève 15–16: 336 (1913), type loc. Swartout Cañon, San Gabriel Mts., *Abrams & McGregor* 642; calyx-teeth shorter and corolla longer than in typical Linanthus breviculus.

28. **L. nashianus** Jepson sp. n. Stems several from the base, sometimes one and branching above, 1½ to 8 inches high, puberulent; leaf and bract divisions 2 to 4 lines long, densely and regularly ciliate, otherwise subglabrous; calyx intervals scarious to base, the intervals narrower below; calyx-teeth scarious-margined on lower half; corolla white, 7 to 9 lines long, the limb 4 to 5 lines broad, the tube finely and rather densely spreading-puberulent, 3 to 5 times as long as the lobes.—(Caules nunc plures ab basi, nunc unus et superus ramosus, 1½–8 unc. alti, puberulentes; foliorum bractearumque segmenta 2–4 lin. longa, dense et regulariter ciliata; calycis intervalla scariosa usque ad basim, angustiora infra; calycis dentes ab basi ad mediam partem scarioso-marginati; corolla alba, 7–9 lin. longa, limbo 4–5 lin. lato, tubo minute subdense patenter puberulenti, lobis 3–5-plo longiore.)

Openly wooded mountain slopes or flats, 2800 to 7300 feet: southern Sierra Nevada in Tulare and Kern Cos.; Tehachapi Mts. May-June.

Locs.—S. Sierra Nevada: Lloyd Mdws., Kern River, se. Tulare Co., *Jepson* 4903; Kelly Camp, Greenhorn Mts., *C. N. Smith* 32a; Poso Creek, Kern Co., *C. N. Smith* 192; Greenhorn Summit, Greenhorn Mts., *C. N. Smith* 32; Davis ranger sta., Greenhorn Mts., *Charlotte Nash Smith* 209 (type); Piute Mts., Kern Co., *C. N. Smith* 174. Tehachapi Mts.: Bear Mt., *Jepson* 7182.

Refs.—LINANTHUS NASHIANUS Jepson; type loc. Davis ranger sta., Greenhorn Mts., *Charlotte Nash Smith* 209. *L. parviflorus* Cov., Contrib. U. S. Nat. Herb. 4:153 (1893). *Gilia nudata* Brand; Engler, Pflzr. 4^{250}:138 (1907), as to Kern Co. plants; not L. nudatus Greene (1895). *L. breviculus* var. *nudatus* Mason; Jepson, Man. 806 (1925).

29. **L. oblanceolatus** Eastw. Stem simple or with a few short branches, 1½ to 6 inches high; herbage scantily puberulent; cotyledons connate-perfoliate, persistent; leaf-blades palmately parted, the lobes spatulate or oblanceolate to linear-oblanceolate, somewhat callous-margined, 1½ to 4 lines long; flowers congested in a terminal head or occasionally 1 or 2 flowers in the uppermost axils; calyx-tube membranous below the sinuses, somewhat distended by the maturing capsule; calyx-lobes lanceolate, equaling or a little longer than tube; corolla salverform, white, 4 to 6 lines long, the lobes quadrate, truncate or emarginate, the tube equaling or somewhat exceeding the bracts, the throat yellow; stamens inserted in the middle of corolla-throat, barely exserted from throat, exceeding the style; capsule-cells 1-seeded.

Mountain flats and slopes, 8400 to 10,000 feet: basin of upper Kern River between Volcano Creek and the mouth of the Little Kern. July.

Field note.—Linanthus oblanceolatus is a narrow endemic of Tulare Co. in the basin of the upper Kern River and also on its tributaries south of the Grand Cañon of the Kern. It seems to be relatively uncommon or at least inconspicuous and apparently known from only the following definite stations: Hockett Mdws., *Culbertson* 4221; Chagoopah plateau, *Sharsmith* 3827; Crabtree Mdw., Mt. Whitney, *Hall & Babcock* 5554; Templeton Mt., near Kern Peak, *Jepson* 4969; Smith Mdw., Fish Creek (Engler, Pflzr. 4^{250}:136).

Refs.—LINANTHUS OBLANCEOLATUS Eastw.; Brand in Engler, Pflzr. 4^{250}:136 (1907); Jepson, Man. 806 (1925). *Gilia oblanceolata* Brand, l.c., type loc. upper Kern River, *Hall & Babcock* 5554. *G. oblanceolata* var. *culbertsonii* Brand, l.c. 137, type loc. Hockett Mdws., Tulare Co., *Culbertson* 4221 (isotyp. vidi). *G. tularensis* Brand, l.c., 136, type loc. Smith Mdw., Fish Creek, Tulare Co., *Hall & Babcock* 5211 (typ. non in hb. Univ. Cal.).

10. SIPHONELLA Nutt.

Perennial herbs, the many stems from a woody root-crown. Leaves palmately divided into narrow divisions. Flowers in loose or capitate cymes. Calyx-lobes lanceolate, as long to ⅔ as long as tube. Corolla white, rarely rose, salverform. Stamens equal, shortly exserted from the throat or sometimes included, the filaments equally inserted in lower part of throat. Ovary 7 to 10-ovuled.—Species 2, western North America. (Diminutive of Greek siphon, a small pipe, referring to the corolla-tube.)

Flowers clustered in head-like cymes, mostly sessile; calyx-tube narrowly scarious beneath the sinuses ½ to ⅔ the way to base; leaf-lobes linear, the leaves usually with leaf-fascicles in their axils; herbage pubescent; North Coast Ranges, Sierra Nevada and San Bernardino Mts. 1. *S. nuttallii*.

Flowers in loose cymes, mostly pedicled; calyx-tube not scarious beneath the sinuses or only obscurely so; leaf-lobes subfiliform, the leaves usually without leaf-fascicles in their axils; herbage glabrous; S. Cal. mts.......2. *S. floribunda*.

1. **S. nuttallii** Hel. BRUSH GILIA. Stems many to numerous from a woody root-crown, erect or ascending, simple or oppositely branched, 3 to 9 inches high; herbage minutely puberulent; leaves palmately divided into 3 to 7 linear lobes 3 to 10 lines long; lowermost leaves sometimes simple and ovate to orbicular; flowers sessile or commonly so, clustered in head-like cymes; calyx-lobes narrow-lanceolate or subulate, about as long as the tube; hyaline intervals below calyx sinuses well-defined, extending ½ to ⅔ the way to base; corolla 3½ to 5 lines long, the throat commonly yellowish, the tube puberulent, shorter than or a little exceeding the calyx and usually a little longer than the obovate corolla-lobes; ovary with 7 to 10 ovules; capsule oblong.

Rocky or brushy slopes in the mountains, (3500 or) 5500 to 12,000 feet: North Coast Ranges from western Siskiyou Co. to Humboldt and Trinity Cos.; Sierra Nevada (mostly on the east side or on high easterly slopes or easterly plateaus, though not wholly so) from Modoc Co. to Kern Co.; White Mts.; San Bernardino Mts. South to Lower California, east to New Mexico, Colorado and Wyoming, north to Washington. July-Aug.

Field note.—In the desert ranges Siphonella nuttallii is often abundant. Between 9500 and 12,000 feet it is not only common in such a range as the White Mountains but occurs in various habitats: in the Artemisia tridentata association; on meadow flats; on sand slopes about meadows, coloring hundreds of yards; on boulder-strewn pine slopes though infrequent. In number of individuals it is the most common species after Artemisia tridentata.

Locs.—North Coast Ranges: Cuddihy Valley (ridge above), w. Siskiyou Co., *Jepson* 2854; Dorleska, Trinity Co.; French Camp, Humboldt Co., *Tracy* 5349. Sierra Nevada: Mill Creek, Warner Mts., e. Modoc Co., *L. S. Smith* 991; Lake Tahoe, *Lemmon*; Silver Mt., Alpine Co., *Brewer* 2042; Vermilion Valley, Fresno Co., *Jepson* 13,220; Blaney Mdws., Fresno Co., *E. Ferguson* 448; Kearsarge Mill, w. Inyo Co., *Jepson* 870; Farewell Gap, Tulare Co., *Jepson* 1007; Piute Peak, Kern Co., *Purpus* 5062. White Mts.: betw. Silver Cañon and Big Prospector Mdw., *Jepson* 7234. San Bernardino Mts.: Seven Oaks, *Parish* 3686. Colo.: Tennessee Pass, *Jepson* 14,999.

Refs.—SIPHONELLA NUTTALLII Hel., Muhl. 8:57 (1912). *Gilia nuttallii* Gray, Proc. Am. Acad. 8:267 (1870), type loc. n. Rocky Mts. (probably Wyo.), *Nuttall*, the locality and collector first cited. *Linanthus nuttallii* Greene; Mlkn., Univ. Cal. Publ. Bot. 2:54 (1904). *S. montana* Nutt.; Gray, l.c. 267, as synonym, type loc. not given. *Gilia nuttallii* var. *montana* Brand in Engler, Pflzr. 4^{250}:125 (1907). *S. parviflora* Nutt.; Gray, l.c. 267, type loc. not given. *Gilia nuttallii* var. *parviflora* Brand, l.c. 125. *Linanthus saxiphilus* Dav., Bull. S. Cal. Acad. 19:10 (1920), type loc. Seven Oaks, San Bernardino Mts., *Davidson* 2242. *Leptodactylon nuttallii* Rydb., Bull. Torr. Club 33:149 (1906); Jepson, Man. 807 (1925).

2. **S. floribunda** (Gray) Jepson comb. n. Stems several to many from a woody base, erect, 7 to 15 inches high; herbage glabrous; leaves palmately divided into 3

or 4 subfiliform lobes 3 to 10 lines long, their axils mostly without leaf-fascicles; flowers borne in loose terminal cymes with pedicels 2 to 9 lines long, or sometimes sessile; calyx cleft ⅓ to ½ into ovate-lanceolate lobes; corolla 6 to 9 lines long, its tube little or not at all exceeding the calyx, its limb 4 to 9 lines wide; ovary with 7 to 9 ovules.

Valleys and mountain slopes in or bordering both sides of the sierran range of Southern California from the San Jacinto Mts. to the Cuyamaca and Laguna mountains and thence west to the Santa Ana Mts. (100 or) 3000 to 6000 feet. South to Lower California, east to New Mexico and Utah. Apr.-July.

Locs.—Cismontane S. Cal.: San Jacinto, *Miles;* Santa Rosa Indian Village, Santa Rosa Mts., *Jepson* 1445; Leach Cañon, Santa Ana Mts., *Munz* 5048; Cuyamaca, *T. Brandegee;* Laguna Mts., *Cleveland;* Descanso, s. San Diego Co., *Parish* 4425; Campo, se. San Diego Co., *Abrams* 3708. West side of Colorado Desert: Thermal, Coachella Valley, *T. Brandegee.* Inhabiting Coyote Cañon, Santa Rosa Mts. (*Hall* 2767a), is a form, var. HALLII, with entire leaves (folia integra).

Refs.—SIPHONELLA FLORIBUNDA Jepson. *Gilia floribunda* Gray, Proc. Am. Acad. 8:267 (1870), type loc. "California, probably on se. borders," *Coulter* 454 (as per Coulter's route, doubtless on sw. slopes Santa Rosa Mts.). *Linanthus floribundus* Mlkn., Univ. Cal. Publ. Bot. 2:55 (1904). *Gilia nuttallii* var. *parviflora* subvar. *floribunda* Brand; Engler, Pflzr. 4^{250}:125 (1907). *Leptodactylon nuttallii* var. *floribundum* Jepson, Man. 808 (1925). *Gilia nuttallii* var. *floribunda* Munz, Man. 399 (1935). Var. HALLII Jepson.

11. **LANGLOISIA** Greene

Low annuals. Leaves alternate, linear to cuneate, regularly toothed as if shallowly pinnatifid, the lower teeth or segments replaced by long bristles, the upper teeth or segments bristle-tipped. Flowers in terminal bracteate heads, the bracts with bristle-tipped lobes. Calyx-lobes equal, bristle-tipped, in fruit splitting to base. Corolla showy, tubular-funnelform, 2-lipped with usually 3 lobes in the upper lip and 2 in the lower, or regularly 5-lobed with the lobes only obscurely disposed in 2-lipped fashion. Stamens inserted in the corolla-throat, the filaments exserted from the throat and often somewhat declined. Capsule 3-sided, 2 to 9-seeded; seeds somewhat mucilaginous when wetted.—Species 5, western North America. (A. B. Langlois, a botanist of Louisiana.)

Leaves abruptly dilated at apex from a narrow base, the lateral bristles 2 or 3-forked or simple; corolla regular; stamens shorter than corolla-lobes; capsule cells 3 to 9-seeded.
  Corolla-lobes not dotted, about ⅓ as long as tube; capsules 2 to 3½ lines long........................ 1. *L. setosissima.*
  Corolla-lobes purple-dotted, nearly as long as tube; capsules 3 to 5 lines long....2. *L. punctata.*
Leaves linear to spatulate in outline, the rachis broad or ligulate, the lateral bristles simple; corolla strongly bilabiate; stamens as long or longer than the corolla-lobes, at least longer than the lower lip, strongly declined; capsule-cells 2 to 6-seeded.
  Corolla 5 to 7 lines long, the lobes linear to oblanceolate, acute or acutish or tapering at tip, the upper lip without appendages in the sinuses; calyx nearly as long to longer than corolla-tube..3. *L. schottii.*
  Corolla 7 to 9 lines long, the lobes oblong, truncate or truncatish and toothed at tip; sinuses of the upper lip of the corolla with a small palate-like process turned inwards in the notch; calyx ½ to ¾ as long as corolla-tube..................................4. *L. matthewsii.*

1. **L. setosissima** Greene. Plant low or depressed, 1 to 9 inches broad, the main axis usually short, erect, ¼ to 2¼ inches high, the branches spreading horizontally or ascending; herbage subglabrous to puberulent; leaves 6 to 11 lines long, cuneately and somewhat abruptly dilated upward from a slender petiolar base, 3-toothed at apex and with 1 or 2 pairs of teeth below these, all bristle-tipped, these bristles simple or sometimes 2 or 3-forked, the broad petiolar base with 2 to 7 pairs of 2-forked bristles on the margins; calyx-lobes (to tips of bristles) ⅔ to nearly as long as corolla-tube; corolla lavender-blue, regular or nearly so, 7 to 9 lines long, the lobes 1 to 1½ lines wide, about ⅓ as long as the tube; capsule 3-sided, narrowly ovate to oblong, acute, 2 to 3½ lines long, the cells 3 to 9-seeded.

Gravelly hills and sandy mesas and washes of desert valleys, 100 to 4500 feet: Colorado Desert; eastern Mohave Desert; Inyo Co. East to Arizona, northeast to Nevada and Idaho. Apr.

Locs.—Colorado Desert: San Felipe Narrows, e. San Diego Co., *Jepson* 8794; wash near Seventeen Palms, *Clary* 2030; Silent Cañon, se. end Santa Rosa Mts., *Jepson* 11,695; Palm Springs (of Mt. San Jacinto), *Gilman* 15; Painted Cañon, Mecca Hills, *Jepson* 11,659. Eastern Mohave Desert: Mitchell Caverns, Providence Mts., *Mary Beal* 363; Needles (10 mi. w.), *Newlon* 541. Inyo Co.: Mesquite Sprs., n. end of Death Valley, *C. N. Smith* 107.

Refs.—Langloisia setosissima Greene, Pitt. 3:30 (1896); Jepson, Man. 808 (1925). *Navarretia setosissima* T. & G.; Torr., Bot. Ives, 22 (1860), type loc. Big Cañon, mouth of Diamond River, nw. Ariz. *Gilia setosissima* Gray, Proc. Am. Acad. 8:271 (1870). *Loeselia setosissima* Gray; Peter in Engler & Prantl, Nat. Pflzfam. 4^{3a}:54 (1891). *Langloisia setosissima* var. *campyloclados* Brand; Engler, Pflzr. 4^{250}:171 (1907), type from Utah, *Parry* 190.

2. **L. punctata** Goodding. Lilac Sunbonnet. (Fig. 392.) Low flat-topped plants 1 to 2 inches high, 2 to 7 inches across, seeming as if prostrate; herbage minutely tomentulose or rarely glabrate; leaves with deltoid 3-toothed or 3-lobed apex, sometimes with a pair of teeth or lobes below the 3 terminal teeth, all the teeth bristle-tipped and the petiolar or cuneate base with simple or 2 or 3-forked bristles; flowers subsessile; calyx-lobes $\frac{4}{5}$ to as long as corolla-tube; corolla lilac, 7 to 10 lines long, subregular, its lobes about 2 lines wide, purple-dotted, each with 2 very shallow longitudinal channels from above the middle towards the base and ending below in a lunate yellow ridge; capsule narrowly oblong, acute, 3-sided, the cells 3 to 9-seeded.

Gravelly hills and mesas, 900 to 4500 feet: Inyo Co.; central and eastern Mohave Desert. East to Nevada and Arizona. Apr.-June.

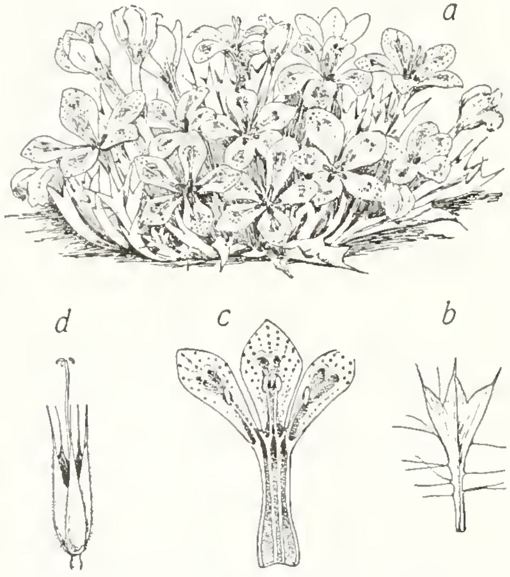

Fig. 392. Langloisia punctata Goodding. *a*, habit, × 1; *b*, leaf, × 1; *c*, long sect. corolla, × $1\frac{1}{2}$; *d*, calyx and pistil, × $1\frac{1}{2}$.

Locs.—Inyo Co.: Silver Cañon, White Mts., *Heller* 8308; Bishop, *Almeda Nordyke;* Argus Range (n. end), *C. N. Smith* 139; Hanaupah Cañon, Panamint Range, *Jepson* 7010. Mohave Desert: betw. Kelso and Baker, *Jepson* 20,582; Amboy, *Newlon;* Ludlow, *Jepson* 5494; Lavic (5 miles s.), *J. Grinnell;* Newberry (lava fields sw.), *Newlon* 498; Ord Mt., *Jepson* 15,496; Barstow, *Jepson* 5361.

The anthers, borne on very short filaments inserted unequally in the throat, approximate about the style at mouth of throat, leaving pin-hole entrances to the tube beween the filaments.

Refs.—Langloisia punctata Goodding, Bot. Gaz. 37:58 (Jan., 1904); Hel., Muhl. 1:57 (Feb., 1904); Jepson, Man. 808, fig. 780 (1925). *Gilia setosissima* var. *punctata* Cov., Proc. Biol. Soc. Wash. 7:72 (1892), type loc. Surprise Cañon, Panamint Range, *Coville* 716. *Navarretia setosissima* var. *punctata* Cov., Contrib. U. S. Nat. Herb. 4:154 (1893). *Gilia punctata* Munz, Man. 402 (1935). *L. lanata* Brand; Engler, Pflzr. 4^{250}:169 (1907), type loc. Candelaria, Nev., *Jones* 3965.

3. **L. schottii** Greene. Plants low-rounded or depressed, $\frac{3}{4}$ to 2 inches high, the main axis very short and bearing mostly divaricately-spreading branches $\frac{1}{2}$ to 3 inches long; branches sparsely leafy or peduncle-like, ending in dense or head-like clusters of flowers, the clusters leafy-bracteate; herbage pubescent; leaves linear or ligulate, $\frac{1}{2}$ to $1\frac{1}{8}$ inches long, regularly toothed (as if very shallowly pinnatifid), the teeth bristle-tipped or the teeth replaced by bristles; upper bracteal leaves often cuneate or dilated at apex and strongly 3-toothed at apex; calyx about $\frac{2}{3}$ as long as corolla, divided nearly to base into lanceolate lobes tipped with a long bristle; corolla pale pink, lavender, white or yellow, 5 to 7 lines long, the upper lip 3-lobed (the sinuses not so deep as the sinuses between the lips), its lobes spreading, purple-

spotted or purple-arched or -patterned; lower lip 2-lobed, its lobes shorter than the upper ones, divergent, without color markings or sometimes purple-dotted toward base, the sinus more deeply parted than the sinuses between the lips; or corolla sometimes regular; corolla-lobes linear to oblanceolate, acute; stamens strongly declined, these and the style exserted; capsule ovate, 3-sided, 1½ to 2 lines long, the cells 2 to 6-seeded.

Sandy valleys and flats and sandy washes on tilted mesas, 50 to 2700 feet: San Joaquin Valley in Kings Co.; eastern Mohave Desert; Colorado Desert (west and northwest sides); cismontane Southern California in San Diego and Riverside Cos. East to southern Utah and to Arizona; south to Sonora and Lower California. Apr.

Flower variation.—The corolla of Langloisia schottii is variable in color, ranging from pink to sky-blue or white or yellow. Sometimes the corolla is regular but most frequently it is bilabiate with 3 lobes in the upper lip and 2 in the lower. The 3 upper lobes are often embellished with a red or pink or purple color pattern, such as one arch or two arches side by side beneath a white splotch, or are provided with quadrate brownish markings. The 2 lower lobes are smaller and usually unmarked, exhibiting no color pattern, or if the lower lip consists of one lobe medianly placed, then the upper lip consists of 4 lobes. In such case the fourth lobe of the upper lip does not usually exhibit the pattern of arches or other color markings characteristic of the other 3 lobes or not so distinctly, or sometimes all four have the same pattern.

Field note on Langloisia schottii and L. matthewsii in east-central Mohave Desert.—"Langloisia schottii, much less common than L. matthewsii, is a small plant, usually less than 2 inches high, sometimes less than 1 inch. When found growing with L. matthewsii, it blooms first. It has smaller, more delicate flowers than L. matthewsii. The corolla is pale pink with purple-streaked throat, the lobes much shorter than the tube (⅓ to ½ as long), the upper lip with 2 lobes, the lower with 3 lobes, these lobes purple-spotted but not in the elaborate pattern of L. matthewsii. Langloisia matthewsii, on the other hand, is very common over wide-spread areas, the plants 2 to 6 inches high and often twice as broad. The corolla, ½ to ¾ inch long, varies from pale to deep pink or sometimes it is light salmon yellow; the lobes equal the tube or they are ⅘ as long. The upper corolla-lip is 3-lobed, the lower with 2 spreading lobes, or sometimes with 1 median lobe below and 4 lobes above. The upper lobes are elaborately patterned with an arched design of purple dots above a double oblong area. The plants with yellow flowers are, it is certain, merely a color variation, since they are identical with the pink ones in every other way. The two color forms of this species are often found growing together."—Mary Beal, in Jepson Corr. 45:41–42, ms.

Locs.—Kings Co.: Kettleman Hills near Avenal, *Hoover* 3326. Eastern Mohave Desert: Stoddard Well, *Jepson* 5912; Barstow, *Jepson* 17,199; Yermo, *Jepson* 15,872; Black Cañon, Providence Mts., *Mary Beal* 512; Colton Well, Providence Mts., *Mary Beal* 244; Danby (3 mi. e.), *Newlon* 527; Essex, *Jepson* 18,165; Needles, *Jones* 3805. Colorado Desert: Maria Mts., n. of Palo Verde Valley, *Schellenger;* Palm Springs of San Jacinto, *Newlon* 423; Palm Cañon, n. of Vandeventer Flat, *Jepson* 1360; Palm Cañon of San Isidro (apron at mouth), *Jepson* 8820; Vallecito, e. San Diego Co., *Jepson* 8588; Myers Creek bridge, foot of Mountain Sprs. grade, *Jepson* 11,761; Coyote Wells, sw. Imperial Co., *Jepson* 11,751; Jacumba, San Diego Co., *Cleveland*. Cismontane S. Cal.: Palomar Mt.; Temecula River, betw. Aguanga and Temecula, sw. Riverside Co., *Jepson* 1552.

Refs.—LANGLOISIA SCHOTTII Greene, Pitt. 3:30 (1896); *Jepson,* Man. 809 (1925). *Navarretia schottii* Torr., Bot. Mex. Bound. 145 (1859), type loc. Colorado Desert (first mentioned locality), *Schott. Gilia setosissima* var. *exigua* Gray, Proc. Am. Acad. 8:271 (1870), based on Navarretia schottii Torr. *G. schottii* Wats., Bot. King 267 (1871). *Loeselia schottii* Gray, Bot. Cal. 2:466 (1880).

Langloisia flaviflora Dav., Bull. S. Cal. Acad. 21:39 (1922), type loc. Willow Sprs., s. base Tehachapi Mts., *Davidson* 3506. This is based on the characters of yellow corollas and short styles (equaling the calyx), which, if constantly associated might be warrant for a valid species. Yellow-flowered plants growing at Box S Sprs., southern Mohave Desert, have, however, styles exceeding the calyx.

4. **L. matthewsii** Greene. Main axis very short, erect, 1 to 1½ inches high, bearing many horizontal or divaricate branches, forming a low plant 1 inch to 1¼ feet broad; branches sparsely leafy or naked and peduncle-like, simple or branched above, ending in dense or head-like clusters of flowers, the heads leafy-bracteate; herbage thinly villous; epidermis of the stems white; leaves linear or spatulate, ¼ to 1¼ inches long, regularly and shallowly pinnatifid, the lobes spine-tipped or replaced by white bristles, the bristles often recurving; bracts linear, margined with long bristles; calyx about ½ to ¾ as long as corolla-tube, divided nearly to base

into lanceolate lobes tipped with a long bristle; corolla bilabiate, white, sky-blue or pink, 7 to 9 lines long, its lobes oblong, truncate at apex and subentire or 3-toothed or retuse with a mucro in the notch, or sometimes rounded at apex, the 3 upper lobes with a characteristic white and red pattern, the 2 lower smaller and unmarked, or often one of the lower somewhat marked and approximate to the upper lip; stamens strongly declined, conspicuously exserted; anthers yellow or sometimes blue; style exserted; capsule ovate, 3-sided, 1½ to 2 lines long, 2 to 6-seeded.

Sandy mesas, valleys and washes, 600 to 4700 feet: Mohave Desert; Diablo Range; southern Sierra Nevada in Kern Co.; Inyo Co. East to Nevada and Arizona, south to Sonora. Apr.-June.

Field note.—In years of highly favorable or exceptional precipitation, Langloisia matthewsii may be extremely abundant on open plains and in sandy valleys almost throughout the Mohave Desert. In such years the individuals are well-developed, forming low round mound-like plants 8 to 12 inches in diameter and one-third to one-half as high.

Usually the corolla shows 3 lobes in the upper lip and 2 lobes spreading laterally in the lower lip. The lobes of the upper lip usually show a distinctive double pink arch (as a color pattern) beneath a white splotch. If one of the lobes of the lower lip is moved to the upper lip, this fourth lobe of the upper lip usually does not show the pink arch or it is less distinct.

Locs.—Mohave Desert: Rosamond, *Davy;* Rock Creek, n. slope San Gabriel Mts., *Peirson* 468; Mohave sta. (15 mi. e.), *Jepson* 15,437; Cajon Pass (desert side), *Jepson* 6128; Saltdale, *Jepson* 19,502; Amargo, *Jepson* 15,776; Johannesberg, *Jepson* 19,515; Kramer, *Jepson* 5325; Searles Lake, *Jepson* 7141; Hinkley, *Jepson* 15,545; Barstow, *Jepson* 5387; Ord Mt., *Jepson* 15,514; Paradise Valley (n. of Calico Mts.), *Mary Beal* 581; Lavic, *Jepson* 15,598. Inner South Coast Range: Alcalde, n. end Diablo Range, sw. Fresno Co., *T. Brandegee.* Southern Sierra Nevada in Kern Co.: Weldon, *Voegelin* 212; Kernville, *K. Brandegee;* Walker Pass, *Jepson* 19,869. Inyo Co.: Argus Range, *Purpus* 5355; Owens Lake, *Jepson* 5100; Tinnemaha Creek, *Almeda Nordyke;* Bishop, *Almeda Nordyke.*

Refs.—LANGLOISIA MATTHEWSII Greene, Pitt. 3:30 (1896); Jepson, Man. 809 (1925). *Loeselia matthewsii* Gray, Bot. Cal. 2:466 (1880), type loc. Independence, Inyo Co., *Matthews.* *Gilia matthewsii* Gray, Syn. Fl. ed. 2, 2:409 (1886). *Navarretia matthewsii* Cov., Contrib. U. S. Nat. Herb. 4:153 (1893).

12. **LOESELIA** L.

Herbs, sometimes woody below. Leaves alternate, rarely somewhat opposite, entire or often acutely dentate. Flowers terminal on the branchlets, solitary in the axils or in axillary clusters, the bracts conspicuous and imbricated or in ours hardly any. Calyx tubular or campanulate, the intervals broadly scarious to the base beneath the sinuses (in ours). Corolla narrowly funnelform, the limb 5-lobed but cleft more deeply on the sides so as to be, usually, bilabiate or somewhat bilabiate. Stamens glabrous, more or less exserted, equally inserted high or low in the throat. Ovary glabrous, its cells with 1 or 2 or many ovules; style glabrous, exserted.—Species 12, North and South America. (Johann Loesel, died 1655, author of a Flora Prussica.)

1. **L. tenuifolia** Gray. Perennial, the stems numerous, erect from a woody base, 5 to 18 inches high; herbage puberulent; flowers terminal on the branchlets, solitary or in 2 to 4-flowered rather loose clusters; leaves narrowly linear, cuspidate, 9 to 13 lines long, entire or the lowest pinnately parted into 1 pair or 2 remote pairs of short subulate lobes; calyx-lobes lanceolate, cuspidate, ¼ to ⅓ as long as the tube; corolla scarlet, tubular with somewhat dilated throat, 8½ to 13 lines long, the proper tube about 3 lines long; corolla-lobes sometimes quite regular, 3-dentate; stamens and style conspicuously exserted; ovary cells with about 12 ovules.

Cañon sides and dry open ridges, 200 to 2500 feet: mountains on the north and west sides of the Colorado Desert. South to Lower California. May-June.

Locs.—Mammoth Wash, betw. Ogilby and Niland, *Evelyn Gray;* Mountain Sprs. (summit of grade above), e. San Diego Co., *Jepson* 11,809; Carriso Gorge (head of), *Weeks;* Jacumba (3 mi. e.), *Feudge.*

Refs.—LOESELIA TENUIFOLIA Gray, Proc. Am. Acad. 11:86 (1876), type loc. Great Cañon, Cantillas Mts., L. Cal., *Dunn & Palmer.* *Gilia tenuifolia* Gray, Syn. Fl. ed. 2, 2:411 (1886).

HYDROPHYLLACEAE. Phacelia Family

Herbs or shrubs with opposite or alternate leaves. Flowers complete, regular, 5-merous (except the superior ovary which is 1 or 2-celled), borne in racemes or spikes (often scorpioid), or in heads, or solitary. Calyx 5-parted or -divided. Stamens 5, inserted near the base of the corolla, alternate with its lobes, which are imbricate in the bud. Ovary superior. Styles 1, entire or often more or less 2-cleft at apex, or 2 and distinct. Fruit a 1-celled capsule or partly or quite 2-celled by the intrusion of the parietal placentae or their union in the axis; valves 2, rarely 4. Seeds few or many. Seed-coat usually pitted, the cavities regular and honeycomb-like, or sometimes rugulose. Embryo small, in abundant endosperm.—The calyx-lobes are almost distinct in Hydrophyllum, Phacelia, Nama, Eriodictyon, Tricardia and Romanzoffia. Scales or thin projecting lamellae are borne on the lower part of the corolla-tube inside in Hydrophyllum, in most species of Nemophila and Phacelia and very minute ones in Miltitzia. Sometimes narrow scale-like wings are borne on the base of filaments in a few species of Phacelia, Nama and Eriodictyon; these structures are, in terminology, distinguished from scales. The ovary is half-inferior in Nama stenocarpum.—Genera 18, species about 250, all continents except Australia.

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A. Ovary 1-celled, its parietal placentae in age expanded and thin, forming sac-like linings on each side of the cell; style 2-cleft at apex; flowers not scorpioid; herbs, widely distributed.

Stamens longer than corolla; flowers in head-like clusters; leaves alternate or mainly basal; perennials ....1. Hydrophyllum.
Stamens shorter than corolla; flowers in racemes or solitary; leaves (at least the lower) opposite (alternate in Eucrypta micrantha); annuals.
  Ovules borne on the face of the placentae; calyx with appendages (except Ellisia membranacea); mostly diffuse or trailing or climbing plants.
    Flowers solitary and axillary; leaf-blades rather narrow, rather finely pinnately divided in most species..2. Nemophila.
    Flowers in racemes and also solitary, the raceme usually borne in the axil of a leaf set at the base of a 1-flowered peduncle; leaf-blades rather broad, coarsely and pinnately parted..3. Ellisia.
  Ovules borne on both the face and back of the membranous placentae; calyx without appendages; leaves 1 to 3 times pinnately parted..4. Eucrypta.

B. Ovary more or less falsely 2-celled (the placentae protruded into the cavity on partial partitions and often approximate in center or sometimes meeting), or 1-celled with the placentae narrow and strictly parietal.

Ovary pubescent or hairy.
  Flowers in racemes, spikes or cymes, nearly always scorpioid, in a few species simply racemose.
    Leaves all opposite; ovary 2-celled; montane perennial..5. Draperia.
    Leaves alternate or basal; (opposite in 2 annual species in Phacelia).
      Stamens equally inserted; herbs.
        Style 1, cleft; capsule more or less 2-celled, the placentae narrow or thin or lamellate, projecting into the cavity on partial partitions and approximate or meeting in center; stamens not joined at base; (style cleft nearly to base in some species of Phacelia).

Corolla usually blue, purple or white, rarely yellow, deciduous after flowering, the lower part of tube bearing conspicuous lamellate scales inside, or the scales sometimes reduced or in some species none; widespread annuals and perennials............................6. PHACELIA.

Corolla yellow or cream-color, persistent after flowering; annuals.

Flowers erect, on pedicels ⅕ to ½ as long; corolla-scales minute; calyx-lobes linear (or linear-oblanceolate); style (in ours) persistent; capsule ovoid; Lassen and Inyo Cos......................7. MILTITZIA.

Flowers pendulous, on pedicels as long; corolla-scales none; calyx-lobes ovate; style deciduous; capsule compressed; cismontane and transmontane..................................8. EMMENANTHE.

Styles 2 and distinct; capsule 1-celled, the placentae strictly parietal; basal dilations of the stamens joined by a lineate margin; small prostrate annual; cismontane and intramontane..............................9. LEMMONIA.

Stamens unequally inserted; capsule completely or incompletely 2-celled.

Low annual or perennial herbs; leaves entire (except N. rothrockii); styles 2 and distinct, or partly united in 3 species; capsule more or less membranous, 2-valved, its placentae 2 to 50 (or more)-seeded; desert plants or mainly so except 2 species..10. NAMA.

Shrubs; leaves dentate (or entire in 2 species); styles 2 and distinct; capsule coriaceous, 4-valved, when dehiscing behaving as if 4-celled, each cell 1 or 2 (or 3)-seeded (about 6-seeded in one species); mainly cismontane and intramontane, 1 species transmontane..........11. ERIODICTYON.

Flowers solitary on naked peduncles arising from a leaf-rosette on the ground; corolla white; style 2-cleft; montane..12. HESPEROCHIRON.

Ovary glabrous; flowers in loose racemes; corolla white; perennial herbs with mostly basal leaves.

Calyx-lobes strongly dissimilar, the 3 outer cordate, conspicuously enlarged and veiny in fruit; style 2-cleft; transmontane deserts...13. TRICARDIA.

Calyx-lobes alike; style 1, entire; coastal..14. ROMANZOFFIA.

1. HYDROPHYLLUM L. WATER-LEAF

Perennial herbs, ours with horizontal rootstocks, the leaves and peduncles often sub-basal or on short stems. Leaves alternate or mainly basal, pinnately parted or divided. Flowers violet-blue or white, in cymose or head-like clusters. Calyx opening early, little changed in fruit, the sinuses without appendages (in ours). Corolla campanulate, the tube within bearing a pair of narrow longitudinal scales opposite each lobe, one on either side of the midrib, their edges meeting and forming a closed nectar-bearing groove. Filaments long, hairy at the middle, these and the styles long and filiform, conspicuously exserted. Ovules 4; seeds 1 to 4.—Species 7, North America. (Greek hudor, water, and phullon, leaf.)

Proper stems short, 1 to 3 (or 6) inches high, much exceeded by the basal and sub-basal leaves; flowers in dense heads; leaves green above, pale or whitish-canescent beneath, the lobes mostly obtuse, sometimes subacute.

Peduncles short (½ to 1 inch long), recurved in fruit, the flower-clusters borne low; leaf-blades pinnately about 5-divided; n. Sierra Nevada............................1. *H. capitatum.*

Peduncles longer (1 to 9 inches long), not recurved in fruit, the flower-clusters exceeding the leaves or sometimes shorter; leaf-blades pinnately divided into 7 to 13 divisions; Sierra Nevada and Coast Ranges...2. *H. occidentale.*

Proper stems long, 4 to 20 inches high, remotely leafy throughout, the basal leaves usually a little exceeding the stems; flowers in somewhat dense cymes, the pedicels mostly longer than the calyces; leaves green above and below, the lobes or teeth acute; along the north coast or near it.

Leaf-blades pinnate or pinnately divided into 5 or 7 divisions; calyx-lobes grayish.................3. *H. fendleri.*

Leaf-blades subpalmately divided into 3 principal divisions; calyx-lobes green..4. *H. tenuipes.*

1. **H. capitatum** Dougl. CATS-BREECHES. Stems several, short (1 to 3 inches high), bearing low the short-peduncled cymes, both much exceeded by the basal and sub-basal leaves (these 4 to 9 inches high); herbage pubescent, the leaves whitish-canescent beneath; leaf-blades somewhat ovate in outline, 1½ to 3 inches long, pinnately about 5-divided, the divisions ovatish, entire or few-toothed, apicu-

late; petioles 1½ to 4 inches long; peduncles much shorter than the petioles, in fruit recurved, ½ to 1 inch long; pedicels as long as or longer than the calyx; calyx-lobes silky-pubescent and bristly-margined; corolla white, 2½ lines long.

Moist gravel or clay slopes in the mountains, 3000 to 7000 feet: Placer Co. to Modoc and eastern Siskiyou Cos. North to Washington, east to Utah. May-Aug.

Locs.—Deer Park, Placer Co., *Fox;* Truckee, Nevada Co., *Michener;* Chester, Plumas Co., *J. Grinnell;* Hayden Hill, Lassen Co., *L. S. Smith;* Deep Creek ranger sta., Warner Mts., *L. S. Smith* 1107; Bull Mdws., Goosenest Mt., e. Siskiyou Co., *Butler* 1324.

Refs.—HYDROPHYLLUM CAPITATUM Dougl.; Benth., Trans. Linn. Soc. 17:273 (1835), type loc. "interior of Columbia [River], N. W. Am.," *Douglas;* Jepson, Man. 810 (1925). *H. capitatum* var. *alpinum* Wats., Bot. King 249 (1871), type loc. East Humboldt Mts., Nev., *Watson* 868; Jepson, Fl. W. Mid. Cal. 433 (1901).

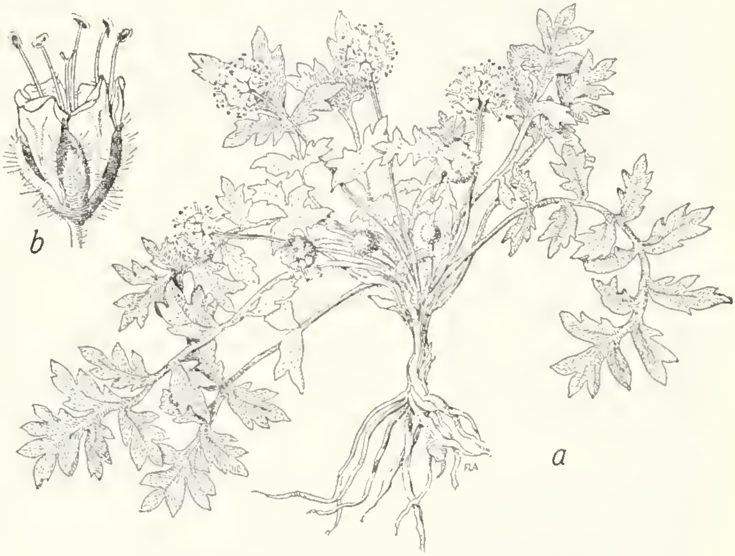

Fig. 393. HYDROPHYLLUM OCCIDENTALE Gray. *a*, habit, × ½; *b*, fl., × 3½.

2. **H. occidentale** Gray. SQUAW LETTUCE. (Fig. 393.) Stems short, 1 to 2 (or 6) inches high, much exceeded by the basal and sub-basal leaves (these 4 to 15 inches high), and bearing terminally or above the middle the long-peduncled cymes, these longer or shorter than the leaves; herbage hirsute, the leaves green above, white-canescent beneath; leaf-blades oblong in outline, 2 to 6 inches long, pinnate, the 7 to 13 leaflets or divisions broadly ovate to oblong, few-toothed, incised or entire, mucronate, ½ to 2 inches long; petioles ¾ to 6 inches long; peduncles 1 to 9 inches long, longer than the petioles, bearing 1 or 2 head-like clusters of flowers, the heads 1 to 1¾ inches broad; pedicels shorter than the calyx; calyx-lobes puberulent and bristly-margined; corolla pale blue or lilac, 4 to 6 lines long.

Mostly montane, open pine woods, brushy slopes or shade of stream borders, 2600 to 8600 feet: Coast Ranges (mostly in the inner range) from Monterey Co. and the Mt. Hamilton Range to western Siskiyou Co.; Tehachapi Mts.; Sierra Nevada from Tulare Co. to eastern Shasta Co. North to Oregon. Apr.-July.

Locs.—Coast Ranges: Mt. San Carlos (Zoe 4:155); Arroyo Mocho, Mt. Hamilton Range, *Elmer* 4330; Mt. Diablo, *Jepson* 9209; Knoxville, ne. Napa Co., *C. F. Baker* 3083; Snow Mt., n. Lake Co., *T. Brandegee;* Sherwood Valley, cent. Mendocino Co., *Davy* 5195; Buck Mt., Humboldt Co., *Tracy* 13,955; Cold Fork Cottonwood Creek, near Greasewood Hills, w. Tehama Co., *Jepson* 21,007; South Fork Mt., Trinity Co., *Jepson* 16,666; Quartz Valley, w. Siskiyou Co., *Butler* 691. Tehachapi Mts.: *Hasse & Davidson* 1738. Sierra Nevada: Tobias Peak, s. Tulare Co., *C. N. Smith* 12; Clough Cave, Tulare Co., *W. Fry* 338; betw. Colony Mill and Marble Fork, Tulare Co., *Jepson* 666; Shaver, Fresno Co., *Mainwaring* 39; betw. Hazel Green and Yosemite, *Jepson* 21,008; Hetch-Hetchy, *A. L. Grant* 992; Hulls Mdw., Tuolumne Co., *A. L. Grant* 1227; Cañon Creek, n. Eldorado Co., *L. S. Smith* 1798; Alta, Placer Co., *Lloyd Austin;* Mineral, e. Tehama Co., *Jepson* 12,278; Goose Valley, ne. Shasta Co., *M. S. Baker.*

Refs.—HYDROPHYLLUM OCCIDENTALE Gray, Proc. Am. Acad. 10:314 (1875); Jepson, Fl. W. Mid. Cal. 433 (1901), ed. 2, 337 (1911), Man. 810 (1925). *H. macrophyllum* Nutt. var. *occiden-*

tale Wats., Bot. King 248 (1871), type loc. Mt. Diablo (summit), *Brewer* 1176. *H. occidentale* var. *watsonii* Gray, Proc. Am. Acad. 10:314 (1875), based on material from "Utah, California," belongs here, at least as to California plants.

3. **H. fendleri** Hel. var. **albifrons** Mcbr. Stems erect, 8 to 20 inches high, remotely leafy throughout, bearing the peduncled cymes terminally or above the middle; herbage thinly soft-puberulent or rarely hirsute; basal and lower leaves usually somewhat longer than the stems; leaf-blades 2 to 4½ (or 6) inches long, pinnate or pinnately divided with mostly 5 or 7 divisions or leaflets, the leaflets ovate, deeply and irregularly incised or toothed, 1¼ to 3 inches long, the basal pair of leaflets often distant from the other leaflets and not exactly opposite; flowers in usually somewhat compact cymes borne on peduncles 1 to 3 inches long; calyx-lobes puberulent and bristly-margined; corolla white, 3 to 5 lines long.

Damp shady places in the mountains, 5000 to 6000 feet: North Coast Ranges from Humboldt Co. to western Siskiyou Co. North to Washington and Idaho. June-July.

Locs.—Corral Prairie, Trinity Summit, n. Humboldt Co., *Tracy* 10,602; Marble Mt., Siskiyou Co., *Butler* 1720.

Refs.—HYDROPHYLLUM FENDLERI Hel., Plant World 1:23 (1897). *H. occidentale* var. *fendleri* Gray, Proc. Am. Acad. 10:314 (1875), based on spms. from "Colorado and New Mexico." Var. ALBIFRONS Mcbr., Contrib. Gray Herb. 49:23 (1917); Jepson, Man. 811 (1925). *H. albifrons* Hel., Bull. Torr. Club 25:267 (1898), type loc. Lake Waha, Nez Perces Co., Ida., *Heller* 3269.

4. **H. tenuipes** Hel. Stems erect, 5 to 18 inches high, remotely leafy throughout, bearing the peduncled cymes terminally or above the middle; herbage thinly hispidulous, the stems and petioles in addition often thinly or conspicuously retrorse-bristly; basal and lower leaves usually longer than the stems; leaf-blades suborbicular in outline, 4 to 7 inches wide, palmately 3-divided, the divisions approximate, the central division larger, deeply 3-cleft, often cuneately short-petiolate, the lateral 2-cleft, sessile, all the divisions ovatish or oblong, serrate and incised, 1 to 3 inches long; petioles 1 to 8 inches long; flowers in roundish cymes, the cymes only moderately dense, 1 to 1½ inches wide, on peduncles 1 to 5 inches long; calyx-lobes green and subglabrous but bristly-margined; corolla dull green or sordid-white, 3 to 4 lines long.

Rich moist woods, often under Redwoods, along the north coast, 5 to 4500 feet: Mendocino Co. to Del Norte Co. North to Washington. May-June.

Ecol. note.—On the flats of creek or river bottoms, Hydrophyllum tenuipes often forms circular colonies in Redwood forest, these circular colonies resulting from propagation by rootstocks.

Locs.—Fort Bragg; McClellan Mt., near Bridgeville, *Tracy* 16,545; Dyerville, Humboldt Co., *Constance* 650; Eureka, *Tracy* 4892; North Fork Elk River, Humboldt Co., *Tracy* 4492; Lawrence Creek, s. of Kneeland, Humboldt Co., *Tracy* 6690; Little Hors-Linto Creek, Trinity Summit, *Tracy* 15,538; Requa, Del Norte Co., *Davy* 5914; Little Mill Creek, Smith River, *Parks* 24,040.

Refs.—HYDROPHYLLUM TENUIPES Hel., Bull. Torr. Club 25:582 (1898), type loc. Montesano, Chehalis Co., Wash., *Heller* 3853. *H. tenuipes* var. *viride* Jepson, Man. 811 (1925), type loc. Fort Bragg, *W. C. Mathews.*

2. **NEMOPHILA** Nutt.

Low annuals. Leaves mostly opposite. Flowers solitary in the axils, the peduncles commonly spreading or in age reflexed. Calyx deeply lobed, with a reflexed appendage in each sinus (the appendages rarely obsolete). Corolla white, blue, purple or variegated, basin-shaped or almost rotate to campanulate-tubular, with 10 minute internal scales in pairs between the stamens, at base. Stamens included, inserted at or near base of corolla. Style more or less 2-cleft. Capsule 1-celled. Seeds 1 to 25, usually with a deciduous caruncle.—Species 16, North America. (Greek nemos, grove, and phileo, to love.)

For use in preparation of the accounts of the genera Nemophila, Ellisia and Eucrypta an unusually large amount of field material and field notes was collected or assembled by the author. The greater portion of the specimens used have also been independently named and some exclusively named by Lincoln Constance, whose recent monographic work on Nemophila and its allied genera specially fitted him for this critical work.

Bibliog.—Bioletti, F. T., Notes on the genus Nemophila (Erythea 3:139–142, pl. 2,—1895). Eastwood, A., Some small-flowered species of Nemophila from the Pacific Coast (Bull. Torr. Club 28:137–160, pl. 15–20,—1901); New species of Nemophila from the Pacific Coast (l.c. 29:471–474, pl. 21,—1902). Chandler, H. P., A revision of the genus Nemophila (Bot. Gaz. 34:194–215, pls. 2–5,—1902); Notes on two Californian Nemophilas (l.c. 44:381–382,—1907). Suksdorf, W. N., Ueber einige Nemophila-Formen (W. Am. Sci. 14:32–33,—1903). Macbride, F., Viticella (Contrib. Gray Herb. 59:29–32,—1919). Chittenden, R. J., & Turrill, W. B., Taxonomic and genetical notes on some species of Nemophila (Kew Bull., 1926:1–12, pls. 1–2, 253,—1926). Constance, L., The genus Nemophila (Univ. Cal. Publ. Bot. 19:341–398, figs. 1–13,—1941); monographia excelsa.

- Flowers large (commonly 4½ to 18 lines broad); calyx-appendages much shorter than the calyx-lobes.
  - Corolla white, 1 to 1⅛ inches broad, with a conspicuous purple blotch at the apex of each lobe; Sierra Nevada, mainly in foothills……1. *N. maculata.*
  - Corolla blue or white, usually uniformly colored or veined or dotted, ½ to 1¼ inches wide (some vars. only 2 to 4 or 8 lines wide); common and widespread……2. *N. menziesii.*
- Flowers smaller (commonly ½ to 4 lines wide).
  - Leaves cuneate, broadly 3-toothed at apex; calyx-appendages ½ (rarely more, usually much less than ½) as long as calyx-lobes; stems diffuse or prostrate; high-montane dwarf. 3. *N. spatulata.*
  - Leaves mostly pinnately divided or pinnatifid; stems usually ascending.
    - Corolla 1½ to 3 times as long as calyx, 2½ to 6 lines wide; calyx-appendages mostly minute or none.
      - Corolla blue to violet, rotate; stamens nearly equaling corolla-lobes; s. Sierra Nevada……4. *N. pulchella.*
      - Corolla commonly white, broadly campanulate or bowl-shaped; stamens hardly extending beyond base of corolla-lobes; Coast Ranges and cent. and n. Sierra Nevada; common……5. *N. heterophylla.*
    - Corolla equaling or shorter than calyx, only rarely and slightly exceeding it, ½ to 2½ lines wide.
      - Corolla equaling the calyx or nearly; seeds 2 to 4, shallowly pitted.
        - Calyx-appendages ½ to ¾ as long as the calyx-lobes; stems usually prostrate; leaf-blades usually oblong in outline, sinuately pinnate-parted or -cleft into 5 or 7 lobes; widespread species……6. *N. pedunculata.*
        - Calyx-appendages usually minute, usually less than ¼ as long as the calyx-lobes; leaf-blades usually suborbicular or broadly ovate, commonly pinnately cleft into 5 lobes; stems usually ascending; north coastal (as to species) or Sierra Nevada (as to vars.)……7. *N. parviflora.*
      - Corolla much shorter than the calyx; calyx-appendages small or minute; seed 1, smooth; stems ascending; Modoc Co……8. *N. breviflora.*

1. **N. maculata** Benth. Sierra Five-spot. Stems several from the base, decumbent or ascending, 5 to 10 inches long; leaf-blades broadly oblong in outline, 1 to 1½ inches long, pinnately parted into 5 to 9 ovate or suborbicular divisions or lobes, the lobes entire or 2 or 3-lobed; upper leaves usually (or sometimes all the leaves) with only 3 (or 5) entire lobes mucronate at tip and with cuneately tapering base, or lanceolate and entire; peduncles surpassing the leaves; corolla white, with rows of purple dots radiating from the center to the large purple spot at the end of each lobe, 1 to 1⅛ inches broad; scales half free, rolled toward the filaments, ciliate.

Valley flats or meadows in the foothills or at middle altitudes in the mountains, 1500 to 6500 feet: Sierra Nevada from Plumas Co. to Kern Co. Apr.-June.

Locs.—Indian Valley, Plumas Co., *Ames;* Penn Valley, Nevada Co., *Jepson* 15,090; Pilot Hill, Eldorado Co., *Jepson* 15,760; Angels Camp, *H. A. Dutton;* Calaveras Big Trees, *A. L. Grant;* Jamestown, Tuolumne Co., *A. L. Grant* 623; Chinese Camp, Tuolumne Co., *Jepson* 18,070; Fresno Flats, Madera Co., *Jepson;* Arnold Mdw., Fresno Co., *A. L. Grant* 1387; betw. Neff Hill and Grant Park, Fresno Co., *H. P. Kelley;* Watts Valley, Fresno Co., *Hoover* 3935; Whipstock Flat, Tulare Co., *Jepson;* Colony Mill, Tulare Co., *W. Fry* 345; Greenhorn Mts., *Hall & Babcock* 5034.

Refs.—Nemophila maculata Benth; Lindl., Jour. Hort. Soc. Lond. 3:320, fig. (1848), type from Cal., *Hartweg;* more specifically, "ad rivulos in montibus Sacramento" (Benth., Pl. Hartw. 326), that is, Sierra Nevada foothills, right bank of the Yuba River (cf. Erythea 5:55); Van Houtte, Fl. Serres, 5: t. 431 (1849); Jepson, Fl. W. Mid. Cal. 434 (1901), ed. 2, 337 (1911), Man. 812 (1925). *Viticella maculata* Mcbr., Contrib. Gray Herb. 59:30 (1919). *N. speciosa* Hartw.; Lindl., Jour. Hort. Soc. Lond., 3:319, fig. (1848), type a garden plant raised from Cal. seed collected by Hartweg.

2. **N. menziesii** H. & A. BABY BLUE-EYES. (Fig. 394.) Stems branching from the base, slender or succulent, diffuse or ascending, 3 to 18 inches long; herbage more or less hirsute-pubescent; leaf-blades oblong in outline, ½ to 1¼ inches long, pinnately divided into 5 to 9 lobes, the lobes entire or 2 or 3-toothed or -incised; petioles ¼ to 1½ times as long; peduncles 2 to 4 times as long as leaves; calyx-lobes 2 to 5 lines long; corolla light to deep blue, often veined with purple, lighter and often dotted toward center, but seldom hairy, basin-shaped, divided about ¾ of the way to base, ½ to 1¼ inches wide; scales broad and wholly adherent to narrow and partly free, often enlarged at tip, laciniate, ciliate or entire.

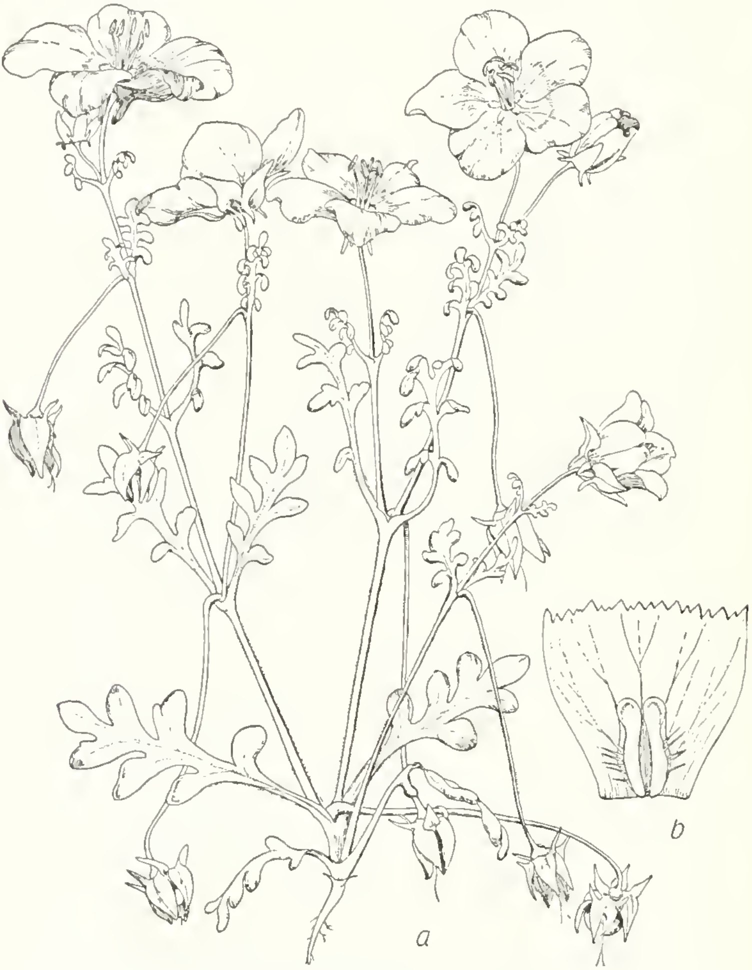

Fig. 394. NEMOPHILA MENZIESII H. & A. *a*, habit, ×1; *b*, scales and sect. of corolla base, × 6.

Moist flats in valleys and on hillsides, 20 to 2000 (or 5000) feet: Coast Ranges from western Tehama Co. and Mendocino Co. to San Luis Obispo Co.; throughout the Great Valley and Sierra Nevada foothills; Tehachapi Mts.; western Mohave Desert; cismontane and intramontane Southern California. North to southern Oregon. Feb.-Apr.

Locs.—Coast Ranges: Paskenta, sw. Tehama Co., *Virginia Bailey;* Fort Ross, Sonoma Co., *Davy* 1673; St. Helena (mts. w.), *Jepson* 15,095; Atlas, Napa Range, *Mary Ferguson* 204; Mill Valley, Marin Co., *Jepson* 6859a; Berkeley Hills, *Jepson;* Lake Merced, San Francisco, *Jepson* 15,094; Mitchell Cañon, Mt. Diablo, *Bowerman* 557; Halls Valley, Mt. Hamilton Range, *Jepson* 8245; New Almaden, Santa Clara Co., *Constance* 2073; San Jose Cañon, n. end Santa Lucia Mts., *E. Ferguson* 318; Idria, San Carlos Range, *Constance & Morrison* 2263; Carriso Plain, se. San Luis Obispo Co., *Condit;* Morro Bay, San Luis Obispo Co., *Summers.* Great Valley: Corning, Tehama Co., *Blankinship;* Butte Pass, Marysville Buttes, *Jepson* 15,088; College City, Colusa Co., *Ruth Johnson;* Sacramento, *Alice King;* Peaceful Glen, nw. Solano Co., *Jepson* 9603; Selma, Fresno Co., *H. P. Kelley;* Bakersfield (20 mi. sw., near Elk Hills), *Mathias* 1328. Sierra Nevada foothills: Clear Creek, Butte Co., *Brown* 252 (det. L. Constance); Penn Valley, Nevada Co., *Jepson* 15,093; Auburn, *Shockley;* Lotus, Eldorado Co., *Jepson;* French Camp near Italian Bar, Tuolumne Co., *A. L. Grant* 2; Mariposa Creek, Mariposa Co., *Constance* 2126; Kelshaw Corners (3 mi. sw.), Madera Co., *Constance* 2199; Little Dry Creek (near Sparkville), Fresno Co., *Jepson* 15,134a; Limekiln Creek, Tulare Co., *Jepson* 2792; Shepherd Cove, Tulare Co., *W. Fry* 391; Cottonwood Creek, Greenhorn foothills, Kern Co., *Allison Krames.* Tehachapi Mts.: Tehachapi Valley, *Jepson* 11,617. Western Mohave Desert: Hesperia (3 mi. sw.), *Newlon* 467. Cismontane and intramontane S. Cal.: Foxins ranch, near Nipoma, Santa Barbara Co., *Brewer* 406; Leonis Valley, n. Los Angeles Co., *Davy* 2610; Santa Catalina Isl. (Erythea 7:142); San Bernardino, *Parish;* Strawberry Valley, San Jacinto Mts., *Jepson* 1310; Saunders Mdw., San Jacinto Mts., *Clary* 1600; Santa Rosa Mts. (10 mi. s. of Kenworthy), *Clary* 2671; Anaheim plain, *Alice King;* Twin Sprs., Temescal Cañon, sw. Riverside Co., *Jepson* 19,125; Oak Grove, e. San Diego Co. (corolla a pale but bright blue with whitish center, but drying dark blue as so often in S. Cal. spms.), *Jepson* 17,153; Warner Ranch, e. San Diego Co., *Jepson* 8530; Grapevine Cañon (head of), e. San Diego Co., *Jepson* 8747; Foster grade, San Diego Co., *Peirson* 8286.

Note on variation.—A species complex composed of continuous variables, yet Nemophila menziesii is variable only within the limits of a fairly definite pattern as to the main species mass. Variation in the size of the flower (often evidently ecological), variation in color, variation in habit—these variations may be grasped. Although the eccentricities of leaf size and lobation are often extreme in a single colony or even on one individual, such colonies seem undoubtedly of one genetic constitution and leaf variation of a certain bias is thus readily accepted as a natural expression in this species aggregate. All the forms here indicated as varieties are, however, connected by obvious intergrades with the species. They are described as follows:

Var. **atomaria** Chandler. More succulent and less pubescent; flowers usually fewer; calyx-lobes shorter and broader; corolla white or pale blue, with radiating lines of black or purple dots, somewhat more deeply divided, hairy at center, 6 to 10 lines wide; scales very narrow or linear, usually hairy, often reduced to a mere line of hairs.—Moist places, Coast Ranges from the Santa Cruz Mts. to Del Norte Co., near the coast except at the north where ranging east to eastern Mendocino Co. and Trinity Co. North to Oregon.

Locs.—Loma Prieta, Santa Cruz Mts., *Davy* 441; Mill Valley, Marin Co., *Jepson;* Atlas, Napa Range, *Mary Ferguson* 205; Kenwood, Sonoma Co., *M. S. Baker;* Fort Ross, Sonoma Co., *Constance* 2158; Round Valley, ne. Mendocino Co., *Westerman;* Bell Sprs., n. Mendocino Co., *Davy;* Bear River ridge, w. Humboldt Co., *Tracy* 9928; Trinity River Valley near Willow Creek, *Tracy* 6026; South Fork Mt., Trinity Co., *Jepson* 16,667; Gasquet, Del Norte Co., *R. Van Deventer* 70.

Var. **venosa** Brand. Corolla with a large purple blotch on each lobe and in throat, the pale blue upper portion of each lobe conspicuously purple-veined.—Moist openly wooded hillslopes, 150 to 1000 feet: southern Napa Range (foothills e. of Yountville; Napa Soda Sprs.).

Var. **integrifolia** Parish. Stems often lax, trailing; herbage hirsute; leaves more variable than usual in the species but mostly (a) obovate with cuneate base and coarsely 3 or 5-toothed at apex, or (b) elliptic in outline and merely coarsely pinnate-lobed or cleft, or (c) some rarely oblong and entire, or (d) sometimes narrow and sinuately pinnate-divided; corolla blue or white, 2 to 4 (or 8) lines wide.—Moist slopes and flats, 50 to 6000 feet: cismontane and intramontane Southern California from Ventura Co. to San Diego Co.; western and southern Mohave Desert. South to Lower California.

Locs.—Pine Cañon, near Elizabeth Lake, n. Los Angeles Co., *Hall* 3081; Casitas Pass, Ventura Co., *Hall* 3139; Mandeville Cañon, Santa Monica Mts., *Clokey & Templeton* 4454; Arrastre Cañon, San Gabriel Mts., *Ewan* 7188; Millard Cañon, San Gabriel Mts., *Peirson* 166; Cajon Pass, *Peirson* 364; Lake Arrowhead, San Bernardino Mts., *Axelrod* 291; San Bernardino foothills, *Parish;* Warrens Well (6 mi. sw.), Morongo Valley, *Clary* 1600; Strawberry Valley, San Jacinto Mts., *Jepson* 1288; French Valley, Palomar Mt., *Jepson* 1537; Escondido, *C. V. Meyer* 99; Mesa Grande, San Diego Co., *E. Ferguson* 50; Pt. Loma, San Diego Co., *Jepson* 6658. Western and southern Mohave Desert: Antelope Valley, *Davy* 2511; Willow Springs Cañon, Old Dad Mts., *Jepson* 20,440.

Refs.—NEMOPHILA MENZIESII H. & A., Bot. Beech. 152 (1833) and 372 (1840), type from Cal., *Collie;* Chandler in Jepson, Fl. W. Mid. Cal. ed. 2, 337 (1911); Jepson, Man. 812 (1925).

Viticella menziesii Mcbr., Contrib. Gray Herb. 59:30 (1919). *N. insignis* Dougl.; Benth., Trans. Linn. Soc. 17:275 (1837), type from Cal., *Douglas;* Lindl., Bot. Reg. t. 1713 (1835); Jepson, Fl. W. Mid. Cal. 434 (1901). *N. menziesii* subsp. *insignis* Brand, Univ. Cal. Publ. Bot. 4:210 (1912). *N. liniflora* F. & M., Sert. Petrop. t. 8 (1846), type loc. Fort Ross, *Wrangel. N. menziesii* subsp. *liniflora* Brand; Engler, Pflzr. 4^{251}:48 (1913). *N. modesta* Kell., Proc. Cal. Acad. 7:93 (1877), type loc. Guadalupe Quicksilver Mine, Santa Clara Co., *Kellogg & McLean. N. intermedia* Bioletti, Erythea 3:141 (1895), type loc. San Francisco Co. (first mentioned loc.), *Bioletti. N. insignis* var. *intermedia* Jepson, Fl. W. Mid. Cal. 434 (1901). *N. menziesii* var. *intermedia* Brand, l.c. *N. brandegei* Eastw., Bull. Torr. Club 29:471, pl. 21, fig. 1 (1902), type loc. Zapato Creek, (misprint "Japato"), sw. Fresno Co., *T. Brandegee. N. menziesii* var. *brandegei* Brand, Univ. Cal. Publ. Bot. 4:210 (1912). *N. menziesii* subvar. *acaulis* Brand, l.c., type loc. Clear Creek, Butte Co., *Brown* 145. *N. maculata* var. *concolor* Brand, l.c., type loc. Clear Creek, Butte Co., *Brown* 252. *N. menziesii* var. *minor* Brand; Engler, Pflzr. 4^{251}:48 (1913), based on the two following: *N. menziesii* f. *umbrosa* Brand, l.c., type loc. Loma Prieta, Santa Clara Co., *Elmer* 4666, and *N. menziesii* f. *arenaria* Brand, l.c., type loc. Tracy, San Joaquin Co., *C. F. Baker* 2868. *N. evermannii* Eastw., Proc. Cal. Acad. 20:152 (1931), type loc. Walker Basin, Kern Co., *Evermann.*

Var. ATOMARIA Chandler, Bot. Gaz. 34:204 (1902); Jepson, Fl. W. Mid. Cal. ed. 2, 338 (1911), Man. 812 (1925). *N. atomaria* F. & M., Ind. Sem. Hort. Petrop. 2:42 (1835), type loc. Ft. Ross, *Wrangel;* Linnaea, 11: Litt.-Ber. 112 (1837); Erythea 2:150 (1894); Lindl., Bot. Reg. t. 1940 (1837); Gartenfl. 13: pl. 442. *N. insignis* var. *atomaria* Jepson, Fl. W. Mid. Cal. 434 (1901). *N. menziesii* subsp. *atomaria* Brand, l.c. 49 (1913). *Viticella menziesii* var. *atomaria* Mcbr., Contrib. Gray Herb. 59:30 (1919). *N. macrocarpa* Eastw., Bull. Torr. Club 29:471 pl. 21, fig. 2 (1902), type loc. Jarnigan (misprint "Jarnagan"), 6 mi. se. of Kneeland, Humboldt Co., *Price. N. menziesii* var. *macrocarpa* Brand, l.c. 50 (1913). Var. VENOSA Brand; Engler, Pflzr. 4^{251}:48 (1913). *N. venosa* Jepson, Fl. W. Mid. Cal. 434 (1901), type loc. foothills se. (not "west") of Yountville, Napa Range, *L. A. R. Peckinpah.* Var. INTEGRIFOLIA Parish, Erythea 6:91 (1898), type loc. Waterman Cañon, San Bernardino Mts., *Parish. N. integrifolia* Abrams, Fl. Los Angeles 321 (1904). *Viticella menziesii* var. *integrifolia* Mcbr., Contrib. Gray Herb. 59:30 (1919). *N. rotata* var. *integrifolia* Munz & West; Munz, Man. 405 (1935). *N. menziesii* var. *annulata* Chandler, Bot. Gaz. 44:381 (1907), type loc. Deadman Pt. near Victorville, Mohave Desert, *Hall & Chandler* 6769. *N. rotata* var. *annulata* Munz & West, l.c. *N. menziesii* subsp. *australis* Brand; Engler, Pflzr. 4^{251}:50 (1913), based on var. integrifolia and related forms (no type named). *N. menziesii* var. *incana* Brand, l.c., type loc. Elizabeth Lake, n. Los Angeles Co., *Hall* 3081. *N. rotata* var. *incana* Munz & West, l.c. *N. menziesii* var. *minima* Brand, l.c., type loc. Pasadena, *Jones* 3037. *N. rotata* Eastw., Bull. Torr. Club 28:159, pl. 20, fig. 27 (1901), type loc. San Diego, *Eastwood;* (in aspect this form resembles those species which normally have small flowers but it shows no evidence of any genetic connection with any of them, whereas it intergrades completely through var. integrifolia with N. menziesii. The author doubtless intended her own collection from San Diego to be the type and it is here definitely indicated and accepted as such. The collection first cited under the description is, however, a collection from the Cantillas Mts., Lower California, *Orcutt* 1128, which, according to both Brand and Chandler is N. pedunculata. Consequently, if this latter were taken as the type, the binomial N. rotata would have to be considered synonymous with N. pedunculata.—R. F. Hoover); Jepson, Man. 814 (1925). *N. menziesii* var. *rotata* Chandler, Bot. Gaz. 44:381 (1907). *Viticella menziesii* var. *rotata* Mcbr., Contrib. Gray Herb. 59:31 (1919).

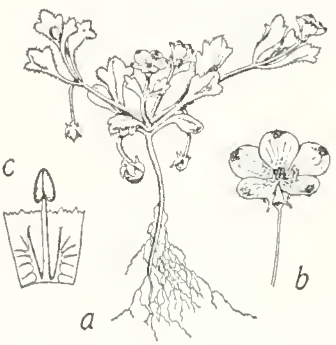

Fig. 395. NEMOPHILA SPATULATA Cov. *a*, habit, × ½; *b*, fl., × 2; *c*, stamen and scales, × 8.

3. **N. spatulata** Cov. (Fig. 395.) Stems few from the base, 1 to 2½ inches long (rarely to 8 inches long), diffuse or prostrate; herbage hispidulous; leaf-blades cuneate or linear-cuneate, coarsely 3-toothed at apex (rarely some leaves on a plant 5 or 7-toothed), ½ to 1½ inches long, gradually narrowed to a petiole ⅕ to as long or often sessile; corolla bluish or white, often with a purple spot at tip of each lobe (thus suggesting N. maculata) and a few dots in center, open-campanulate, 2 to 3 lines long; scales small and laciniate or obsolete; style cleft at apex.

Meadows or moist slopes in the mountains, 4000 to 9200 feet: Sierra Nevada from Tehama Co. to Kern Co.; high cismontane Southern California from Mt. Piños to the San Jacinto Mts. May-July.

Locs.—Battle Creek Mdws., e. Tehama Co., *Grinnell;* Jonesville, Butte Co., *H. F. Copeland* 1302; Chester, Plumas Co., *Constance* 2319; Cisco (6½ mi. w.), Placer Co., *Constance* 2279; Fallen

Leaf Lake, Eldorado Co., *Ottley* 809; betw. Strawberry sta. and Belle Mdw., Tuolumne Co., *Jepson* 6489; Hog Ranch ranger sta., Hetch-Hetchy Valley, *A. L. Grant* 802; Crane Flat, Mariposa Co., *Jepson* 10,439; Lower Soquel Mdws., Madera Co., *Constance* 2371; Huckleberry Mdw., near Grant Park, *Newlon* 211; Greenhorn Pass, Greenhorn Mts., Kern Co., *Purpus* 5706. Tehachapi Mts., *Hasse & Davidson* 1717. Cismontane S. Cal.: Mt. Piños, n. Ventura Co., *Hall* 6395; Bluff Lake, San Bernardino Mts., *Munz* 10,433; Tamarack Valley, San Jacinto Mts., *Hall* 2406.

Refs.—NEMOPHILA SPATULATA Cov., Contrib. U. S. Nat. Herb. 4:156 (1893), type loc. Whitney Mdws., e. Tulare Co., *Coville* 1671; Jepson, Man. 813, fig. 783 (1925). *Viticella spatulata* Mcbr., Contrib. Gray Herb. 59:32 (1919). *N. inconspicua* Eastw., Bull. Torr. Club 28:144, t. 15, fig. 6 (1901), type loc. Bearskin Mdws., near Grant Park, *Eastwood*, not N. inconspicua Henderson (1900). *N. pratensis* Eastw., l.c., 29:474 (1902), a renaming. *N. humilis* Eastw., l.c. 28:150, t. 17, fig. 12 (1901), type loc. betw. Summit sta., Nevada Co., and Summit Soda Sprs., Placer Co., *Eastwood*. *Viticella humilis* Mcbr., l.c. *N. congdonii* Eastw., l.c. 28: 150, t. 17, fig. 12 (1901), type loc. "Tioga Road," probably in Tuolumne Co., *Congdon*.

4. **N. pulchella** Eastw. BLUE-EYED JENNIE. (Fig. 396.) Stem branching, 8 to 16 inches long; herbage thinly hirsute; leaf-blades mostly ovate to ovatish in outline, ¼ to 1 inch long, sinuately pinnate-divided into 5 to 7 remote lobes, the lobes suborbicular to ovate, ½ to 4 lines long, often petiolulate, entire or 3-lobulate; upper leaves entire or few-lobed; pedicels spreading or deflexed, ½ to 1½ inches long; calyx-appendages minute or even obsolete; corolla deep blue to violet, sometimes white, rotate or even reflexed a little from the center, 2½ to 4 lines wide; scales broadly linear, wholly adnate, ciliate or glabrous, or reduced to narrow short-hairy bands; stamens nearly equaling corolla-lobes; capsule globose-ovoid, hirsute.

Moist thickets or in open places of the foothills and mountains, 500 to 5000 feet: Sierra Nevada from Fresno Co. to Kern Co. Apr.-June.

Locs.—Big Sandy Valley, e. base Black Mt., Fresno Co., *Hoover* 3464; Tollhouse, Fresno Co., *Constance* 2210; betw. Dunlap and Millwood, Fresno Co., *Jepson* 2769; betw. Oak Flat and Badger, Tulare Co., *H. P. Kelley;* betw. Cedar Creek and Colony Mill, Tulare Co., *Jepson* 622; betw. Milo and Springville, Tulare Co., *Constance* 2123; Greenhorn Mts., Kern Co., *Hall & Babcock* 5027.

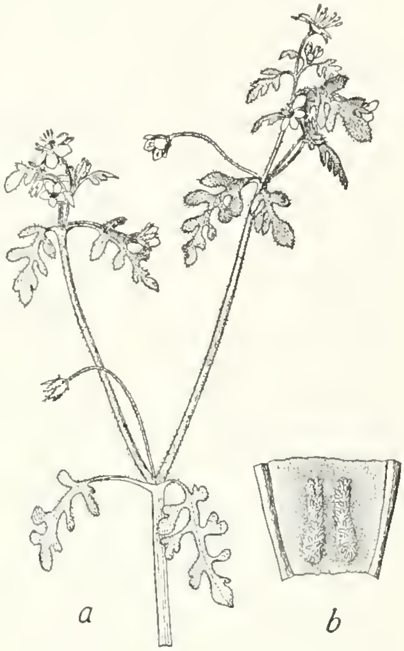

Fig. 396. NEMOPHILA PULCHELLA Eastw. *a*, fl. branchlet, × 1; *b*, gland, × 50.

Var. gracilis Constance. Leaf-blades sinuately pinnate-divided, or (especially the upper) merely pinnately cleft or lobed, or entire, commonly with 2 or 3 such leaf-types on one individual; corolla white, rotate to basin-shaped, 1 to 3 lines broad.—Rocky places or in oak shade, Sierra Nevada foothills from Madera Co. to Kern Co.; Tehachapi Mts.; South Coast Ranges from western Stanislaus Co. and Monterey Co. to southwestern Kern Co. (In habit and leaf-form it is strikingly like N. pulchella, but the flowers are more nearly those of N. parviflora.—R. F. Hoover.)

Locs.—Kelshaw Corners (3 mi. sw.), Madera Co., *Constance* 2200; Little Dry Creek near Sparkville, Fresno Co., *Jepson* 15,140; Auberry (6 mi. sw.), Fresno Co., *Constance* 2207; Squaw Valley, Fresno Co., *Constance* 2225; Exeter (2 mi. e.), Tulare Co., *Constance* 2101; Hobo Hot Sprs., lower Kern Cañon, Kern Co., *Constance* 2117. Tehachapi Mts.: Girard sta., *Heller* 7718. South Coast Ranges: Las Garzas Cañon, w. Stanislaus Co., *Hoover* 4220; Gabilan Range; Tres Pinos Creek, San Benito Co., *Constance & Hoover* 2067; Jamesburg (5 mi. n.), Carmel Valley, *Constance & Hoover* 2050; San Emigdio Cañon, sw. Kern Co., *Davy* 2070.

Refs.—NEMOPHILA PULCHELLA Eastw., Bull. Torr. Club 28:157, pl. 19, fig. 25 (1901), type loc. "Sequoia Mills" (Millwood), Fresno Co., *Eastwood;* Jepson, Man. 814, fig. 784 (1925). *N. exilis* var. *pulchella* Chandler, Bot. Gaz. 34:214 (1902). *Viticella pulchella* Mcbr., Contrib. Gray Herb. 59:31 (1919). Var. GRACILIS Constance, Univ. Cal. Publ. Bot. 19:394 (1941). *N. gra-*

cilis Eastw., Bull. Torr. Club 28:154, pl. 18, fig. 20 (1901), type loc. recorded as "Fresno," *Buckminster,* but almost undoubtedly in the Sierra Nevada foothills east. *N. fremontii* Elmer, Bot. Gaz. 41:319 (1906), type loc. Fremont Peak, Gabilan Range, *Elmer* 4901. *Ellisia fremontii* Brand; Engler, Pfizr. 4^{251}:39 (1913). *N. pulchella* var. *fremontii* Constance, Rhod. 42:39 (1940).

5. **N. heterophylla** F. & M. Cañon Nemophila. Stems slender, erect, ascending or lax, 8 to 13 inches long; herbage thinly hirsute or hirsutulous; leaf-blades ovate in outline, ½ to 2 inches long, pinnately divided or parted into 5 or 7 often remote divisions, the divisions ovate to elliptic or oblong, entire or few-toothed, 1 to 6 lines long; upper or uppermost leaves 3-lobed or subentire or entire, or sometimes similar to the lower; peduncles mostly longer than the leaves; calyx-appendages evident; corolla white or bluish, devoid of blue or purple dots, basin-shaped or broadly campanulate, not hairy within, deeply cleft, 3 to 6 lines broad; scales semi-circular, oblong or triangular, entire or laciniate, rarely narrowly linear or almost obsolete, not reduced to hairy lines; style as long as the ovary.

Shaded or openly wooded slopes or cañons in the hills, 100 to 4600 feet: Coast Ranges from San Benito Co. to western Siskiyou Co.; Sierra Nevada from Madera Co. to Shasta Co. North to Oregon. Mar.-June.

Locs.—Coast Ranges: San Benito Cañon, w. side San Carlos Range, s. San Benito Co., *Jepson* 2721 (det. L. Constance); San Carlos Peak, *Constance & Morrison* 2258; El Toro, near Morgan Hill, Santa Cruz Mts., *Constance & Hoover* 2049; Mt. Day, Mt. Hamilton Range, *R. J. Smith;* Corral Hollow, w. San Joaquin Co., *May Arnold;* Mt. Diablo, *Bowerman* 556; Araquipa Hills, w. Solano Co., *Jepson* 15,089; Putah Cañon, w. of Winters, *Constance* 2045; Atlas, Napa Range, *Mary Ferguson* 215; Salmon Creek, 2 mi. ne. of Bodega, *Constance* 2151; Calistoga (sw.), *Jepson* 4023; Wilbur Sprs., sw. Colusa Co., *Constance* 2146; South Mill Creek, se. of Ukiah, *Jepson* 9228; Cahto, cent. Mendocino Co., *Jepson* 1858; Long Valley, near Laytonville, *Tracy* 5804; Paskenta (5 mi. w.), sw. Tehama Co., *Virginia Bailey;* Trinity River Valley at Willow Creek, *Tracy* 15,292; Yreka, *Butler* 658a. Sierra Nevada: North Fork Willow Creek, Bass Lake, Madera Co., *Constance* 2369; Chowchilla School, Mariposa Co., *Jepson* 12,795; Mormon Bar, Mariposa Co., *Constance* 2131; Yosemite Valley, *Jepson* 4268; Chinese Camp (3½ mi. nw.), Tuolumne Co., *Constance* 2196; Gwin Mine, Calaveras Co., *Jepson* 1785; Mokelumne Hill (3 mi. n.), Amador Co., *Constance & Morrison* 2163; Nashville, Eldorado Co., *Jepson* 18,660; Applegate, Placer Co., *Constance & Morrison* 2171; Squirrel Creek, Rough & Ready, w. Nevada Co., *Constance & Morrison* 2174; betw. Big Chico and Little Chico creeks, Butte Co., *Constance & Morrison* 2177; Pit River, Shasta Co., *Brown* 261.

Refs.—Nemophila heterophylla F. & M., Sert. Petrop. 1, sub t. 8 (1846), type loc. Bodega Bay, Sonoma Co., *Wrangel;* Jepson, Man. 813 (1925). *Viticella heterophylla* Mcbr., Contrib. Gray Herb. 59:31 (1919). *N. exilis* Eastw., Bull. Torr. Club 28:148, pl. 17, fig. 11 (1901), type loc. "Hog Ranch road," near Hetch-Hetchy, *Congdon. Viticella exilis* Mcbr., l.c. *N. divaricata* Eastw., l.c. 28:153, pl. 18, fig. 18 (1901), type loc. Mt. St. Helena, *Eastwood. N. heterophylla* subvar. *divaricata* Brand, Univ. Cal. Publ. Bot. 4:212 (1912). *N. hispida* Eastw., l.c. 28:152, pl. 18, fig. 17 (1901), type loc. betw. Clear Lake and Bartlett Sprs., at base of Bartlett Mt., n. Lake Co., *Eastwood. N. decumbens* Eastw., l.c., 29:473 (1902), type loc. Mt. Diablo, *Curran. N. tenera* Eastw., l.c., 28:153, pl. 18, fig. 19 (1901), type loc. Applegate, Placer Co., *Helen Smith. N. heterophylla* subvar. *tenera* Brand, l.c. *N. heterophylla* var. *tenera* Nels. & Mcbr., Bot. Gaz. 65:66 (1918). *N. flaccida* Eastw., Bull. Torr. Club 28:149, pl. 20, fig. 15 (1901), type loc. Pit River, Shasta Co., *Brown* 261. *Viticella heterophylla* Mcbr. var. *flaccida* Mcbr., l.c. 31. *N. heterophylla* var. *flaccida* Brand, l.c.; Jepson, Man. 813 (1925). *N. inaequalis* Eastw., l.c. 28:149, pl. 20, fig. 16 (1901), type loc. "Russian River," probably in Sonoma Co., *T. Brandegee. N. nemorensis* Eastw., l.c. 28:155, pl. 19, fig. 21 (1901), type loc. South San Francisco, *K. Brandegee;* scales narrowly linear or almost obsolete. *N. nemorensis* var. *gracilis* Brand, l.c., probably belongs here, at least as to first-cited spm., Drytown, Amador Co., *Hansen* 542, although the second-cited spm., Girard sta., Tehachapi Mts., *Heller* 7718, is N. pulchella var. gracilis Constance. *N. heterophylla* var. *nemorensis* Jepson, Man. 813 (1925). *N. glauca* Eastw., l.c. 28:156, pl. 19, fig. 22 (1901), type loc. Big Chico Creek, Butte Co., *Bruce* 2037. *N. nemorensis* var. *glauca* Brand; Engler, Pfizr. 4^{251}:57 (1913). *N. fallax* Eastw., l.c. 28:156, pl. 19, fig. 23 (1901), type loc. Big Chico Creek, *Bruce* 2037 in part. *N. diversifolia* Eastw., l.c., 29:473, pl. 21, fig. 4 (1902), type loc. Mormon Bar, Mariposa Co., *J. W. Congdon* (not "J. G. Congdon").

6. **N. pedunculata** Dougl. Stems branching from the base, prostrate or trailing, sparingly pubescent, 2 to 6 (or 12) inches long; herbage thinly hirsute or hirsutulous; leaf-blades broadly oblong in outline, regularly 5 or 7-lobed or -divided, ¼ to ¾ (or 1½) inches long, the lobes commonly entire; petioles mostly short; peduncles shorter than the leaves, sometimes longer, strongly deflexed in age, bury-

ing, or tending to bury, the capsules; corolla white or pale blue, without dots or often black-dotted (rarely with a purple spot at the apex of each lobe), bowl-shaped, deeply cleft, 1 to 2½ lines broad; scales linear, often reduced to hairy lines; style as long as ovary or longer.

Damp grassy open slopes or in brush, 10 to 7000 feet, transmontane Sierra Nevada from Modoc Co. to eastern Sierra Co.: Sierra Nevada (west slope) from Shasta Co. to Kern Co.; Coast Ranges from western Siskiyou Co. to San Luis Obispo Co.; cismontane Southern California from Santa Barbara Co. to San Diego Co. South to Lower California, east to Nevada, north to British Columbia. Jan.-June.

Geog. note.—The geographic range of Nemophila pedunculata is more extensive than any other species of its genus, since it occurs from British Columbia through Washington and Oregon to California and western Nevada, thence south into Lower California. In California it is found widely throughout cismontane territory in both valleys and mountains and it is also transmontane on the east side of the Sierra Nevada from Modoc County to Sierra County. It has a wide altitudinal range, since it occurs at 10 feet along the coast line and goes up to 7000 feet in the Sierra Nevada. No collections have been made in the transmontane regions of Mono and Inyo counties, nor any in the Mohave and Colorado deserts whose labels as to validity of station may be regarded as fully credible. Although so widely distributed, it is within certain limits remarkably constant, more constant in its characters than any other species. On the basis of herbarium specimens there would appear to be wide gaps in the distribution. Such, however, says R. F. Hoover, is not the case. Field observation is convincing that either by reason of being inconspicuous or by reason of being common it tends to be neglected by most collectors.

Locs.—Coast Ranges: Yreka, *Butler* 658; Trinity River Valley near the South Fork, Humboldt Co., *Tracy* 7858; Lawrence Creek, near Kneeland Prairie, Humboldt Co., *Tracy* 6957; Eureka, *Tracy* 4784; Phillipsville, South Fork Eel River, *Tracy* 7873; Paskenta, sw. Tehama Co., *Constance & Morrison* 2183; Callayomi Valley, sw. Lake Co., *Jepson* 17,439; Mt. Diablo, *Bowerman* 1139; San Francisco, *Chandler* 1800; Isabel Creek, Mt. Hamilton Range, *Chandler* 6039; Carmel Valley, Monterey Co., *Constance* 2051; Hernandez, San Benito Co., *Constance & Morrison* 2270; upper Waltham Creek, w. Fresno Co., *Jepson* 16,159; Cottonwood Cañon, Avenal Ridge, w. Kern Co., *Constance* 2093; Estrella Creek, San Luis Obispo Co., *Constance* 2087. Great Valley: Anderson, Shasta Co., *Alice King;* Antioch; Modesto, *Hoover* 1630. Sierra Nevada (west slope): Hatchet Mt., Shasta Co., *Constance* 2338; Red Clover Valley (2 mi. s.); Clear Creek, Butte Co., *Heller* 13,606; Fallen Leaf Lake, Eldorado Co., *Ottley* 809a; Stony Creek, Amador Co., *Hansen* 1522; Avery (3 mi. w.), Calaveras Co., *Tracy* 5716; Jamestown, Tuolumne Co., *A. L. Grant* 640; Mariposa Creek, Mariposa Co., *Constance* 2127; betw. Oak Flat and Badger, Tulare Co., *H. P. Kelley;* Hobo Hot Sprs., lower Kern River Cañon, *Constance.* Sierra Nevada (transmontane) from Modoc Co. to eastern Sierra Co.: Fort Bidwell, ne. Modoc Co., *Manning* 107; Forestdale, sw. Modoc Co., *M. S. Baker;* Susanville (5 mi. sw.), *Ferris;* Sierra Valley, *Lemmon.* Cismontane S. Cal.: Frazier Mt., n. Ventura Co., *Epling* 1784; San Miguelito Cañon, Santa Barbara Co., *Munz* 10,265; Santa Cruz Isl., *T. Brandegee;* Bear Valley, San Bernardino Mts., *Parish* 1842; Witch Creek, San Diego Co., *Chandler* 5022.

Refs.—NEMOPHILA PEDUNCULATA Dougl.; Benth., Trans. Linn. Soc. 17:275 (1837), type from Cal., *Douglas;* Chandler, Bot. Gaz. 34:207, t. 3 (1902); Jepson, Man. 813 (1925). *Viticella pedunculata* Mcbr., Contrib. Gray Herb. 59: 32 (1919). *N. parviflora* var. *pluriovulata* Torr.; Wats., Bot. King 249 (1871), based on N. pedunculata Benth. *N. sepulta* Parish, Erythea 7:93 (1899), type loc. Bear Valley, San Bernardino Mts., *Parish* 3782; Jepson, Man. 813 (1925). *N. pedunculata* var. *sepulta* Nels. & Mcbr., Bot. Gaz. 65:65 (1918). *Viticella pedunculata* var. *sepulta* Mcbr., l.c. *N. menziesii* var. *minutiflora* Suksd., Deut. Bot. Monat. 18:133 (1900), type loc. Bingen, Wash., *Suksdorf.* *N. minutiflora* Suksd., W. Am. Sci. 14:32 (1903). *N. sepulta* var. *minutiflora* Brand; Engler, Pflzr. 4^{251}:52 (1913). *N. humifusa* Kell.; Eastw., Bull. Torr. Club 28:141, pl. 15, fig. 1 (1901), type loc. San Francisco region, *Kellogg.* *N. pedunculata* f. *humifusa* Brand, l.c. 53. *N. nana* Eastw., l.c. 28:151, pl. 17, fig. 13 (1901), type loc. betw. Upper Lake and Bartlett Sprs., n. Lake Co., *Eastwood.* *N. exigua* Eastw., l.c. 28:157, pl. 19, fig. 24 (1901), type loc. Stony Creek, Amador Co., *Hansen* 1522. *N. alata* Eastw., l.c. 28:158, pl. 20, fig. 26 (1901), type loc. Clear Creek, Butte Co., *Brown* 173. *N. densa* Howell, Fl. Nw. Am. 466 (1901), "Wash. to Cal." *N. sepulta* var. *densa* Brand, Univ. Cal. Publ. Bot. 4:211 (1912). *N. pedunculata* var. *densa* Nels. & Mcbr., Bot. Gaz. 65:66 (1918). *N. erosa* Suksd., West Am. Sci. 14:33 (1903), type loc. Columbia River, Clarke Co., Wash., *Suksdorf* 2315. *N. pedunculata* f. *erosa* Brand; Engler, Pflzr. 4^{251}:53 (1913). *N. pedunculata* f. *chandleri* Brand, l.c., type loc. Rockland, Klickitat Co., Wash., *Suksdorf* 2638 (first cited collection). *N. insularis* Eastw., Proc. Cal. Acad. ser. 4, 21:282 (1935), type loc. San Nicolas Isl., *Howell* 8213.

7. **N. parviflora** Dougl. WOODLAND NEMOPHILA. Stems usually ascending, sometimes decumbent, freely branching and usually matted, ½ to 2¼ feet long; herbage thinly hispid, the hairs on the leaves appressed; leaf-blades suborbicular

to roundish-ovate in outline, disposed to be truncatish at base, 4 to 12 lines long, pinnately cleft or sometimes divided into 5 lobes (or often coarsely 5-dentate); leaf-lobes commonly acute or subacute, the basal pair sometimes distinct; petioles ½ to 1¼ inches long; peduncles shorter than leaves, curved-spreading and sometimes retrocurved, 4 to 14 lines long; corolla white or pale lavender, tubular-campanulate, ¾ to 1¼ lines long; corolla-scales minute, various, but usually half free and laciniate or ciliate, or none; style as long as the ovary or longer; seeds orange.

Moist or shady places in wooded hills, 15 to 1500 (or 4200) feet: Coast Ranges from Monterey Co. to Del Norte Co. North to British Columbia. Mar.-June.

Geog. note.—In California Nemophila parviflora inhabits the Redwood belt and its border woodland of Douglas Fir, Tan Oak or Coast Live Oak. Like a number of coast line species, however, it also extends eastward to the northerly part of the inner North Coast Range, thus reappearing in northern Lake County, in Trinity County and in the cañon of the upper Sacramento River in Siskiyou County.

Locs.—Cone Peak trail, Santa Lucia Mts., *Carter* 1063; Soquel Creek, Santa Cruz Mts., *Jepson* 21,130; Crystal Springs Lake, San Mateo Co., *Constance* 2241; Mt. Tamalpais, *Jepson* 7451; White Sulphur Sprs., Napa Valley, *Chandler* 7569; Russian Gulch, Sonoma coast, *Constance* 2153; Pinnacle Rock Lookout, Bartlett Mt., *Simontacchi* 214; Cahto, cent. Mendocino Co., *Jepson* 1849; Look Prairie, Bull Creek, Humboldt Co., *Constance* 606; Van Duzen River opp. Buck Mt., Humboldt Co., *Tracy* 2726; South Fork Mt., Trinity Co., *Jepson* 16,665; Corral Prairie, Trinity Summit, *Tracy* 10,492; Shasta Retreat, upper Sacramento River, *Condit;* Crescent City (bluffs 5 mi. s.), *Tracy* 12,028; betw. Somes Bar and Jim's ranch, Klamath River, *Chandler* 1537.

Var. **austinae** Brand. Plants small (the stems mostly 2 to 5 inches long); herbage thinly hirsute on stems, moderately hirsute on the leaves, in both appressed or mostly so; leaf-blades coarsely 5-toothed or shallowly lobed (the lobes more commonly rounded than in the species), 5 to 7 (or 12) lines long, gradually and cuneately contracted into a petiole 2 to 11 lines long; corolla small, white or bluish, 1 to 1½ lines wide.—Meadows and hillslopes, 4000 to 5500 feet: northern Sierra Nevada from Sierra Co. to Modoc Co.; North Coast Ranges in Siskiyou Co. East to Nevada, north to Idaho and Washington. Apr.-July.

Locs.—Sierra Nevada: Yuba Pass, Sierra Co., *Constance* 2304; Rich Gulch, Plumas Co., *W. I. Follett* 49; Prattville, Plumas Co., *Constance* 2318; Fredonyer Pass, Lassen Co., *Constance* 2324; Thoms Creek, Warner Mts., Modoc Co., *Constance* 2333. Western Siskiyou Co.: Quartz Valley, *Butler* 1231; Marble Mt., *Chandler* 1649.

Var. **quercifolia** Chandler. OAK-LEAF NEMOPHILA. Pubescence villous (softer and more spreading than in the species); leaf-blades roundish or ovatish in outline, 6 to 9 lines long, sinuately parted or divided into about 5 lobes, the lobes rounded and tending to be broader towards the apex; corolla pale lavender or bluish; peduncles mostly exceeding the leaves.—Montane slopes and cañons, 4000 to 6500 feet: southern Sierra Nevada from Kern Co. to Madera Co.

Locs.—Kernville, Kern Co., *T. Brandegee;* Limekiln Creek, Tulare Co., *Jepson* 2798; Pine Ridge, Fresno Co., *Chandler* 91; Chilkoot Creek, near Bass Lake, Madera Co., *Constance* 2366.

Refs.—NEMOPHILA PARVIFLORA Dougl.; Benth., Trans. Linn. Soc. 17:275 (1837), type from the Columbia River, *Douglas;* Jepson, Fl. W. Mid. Cal. 433 (1901), ed. 2, 338 (1911), Man. 814 (1925). *Viticella parviflora* Mcbr., Contrib. Gray Herb. 59:32 (1919). *N. diffusa* Nutt.; Hook., Kew Jour. Bot. 3:293 (1851). *N. micrantha* Eastw., Bull. Torr. Club 28:146, pl. 16, fig. 8 (1901), type loc. Mt. Tamalpais, *Eastwood. N. kelloggii* Eastw., l.c. 28:147, pl. 16, fig. 9 (1901), type loc. Santa Cruz Mts., *Kellogg & McLean. N. macrophylla* Eastw., l.c. 28:144, pl. 15, fig. 5 (1901), type loc. Sur River, Monterey Co., *Eastwood. N. parviflora* subvar. *macrophylla* Brand; Engler, Pflzr. 4^{251}:55 (1913). *N. plaskettii* Eastw., l.c. 28:147, pl. 16, fig. 10 (1901), type loc. Willow Creek, Santa Lucia Mts., *Plaskett* 32. *N. parviflora* var. *plasketti* Brand, l.c. Var. AUSTINAE Brand, l.c.; Jepson, Man. 814 (1925). *N. austinae* Eastw., l.c. 28:143, pl. 15, fig. 4 (1901), type loc. Davis Creek, Warner Mts., Modoc Co., *R. M. Austin. Viticella parviflora* Mcbr. var. *austinae* Mcbr., Contrib. Gray Herb. 59:32 (1919). Var. QUERCIFOLIA Chandler, Bot. Gaz. 34:210 (1902); Jepson, Man. 814 (1925). *N. quercifolia* Eastw., l.c. 28:142, pl. 15, fig. 3 (1901), type loc. Sequoia Mills (Millwood), Fresno Co., *T. Brandegee.*

8. **N. breviflora** Gray. Stem branching from the base, the branches erect or ascending, 2 to 8 inches high, sparsely retrorse-hispidulous; leaf-blades broadly ovate or suborbicular in outline, very thinly hirsute or subglabrous, often ciliate, ½ to 1¼ inches long, often broader than long, thinly hirsute, pinnately 5-parted or -divided, the lobes ovate to oblong, acute or acutish; pedicels 2 to 6 lines long; calyx-lobes bristly-ciliate, otherwise glabrous; corolla white, broadly tubular, ½ to 1 line long, its tube white, the short lobes purplish; style very short; capsule 1-seeded; seed large, reddish-brown, smooth.

Meadows or moist slopes, 5000 to 6000 feet: Modoc Co. East to Utah, north to Montana and British Columbia. May-July.

Geog. note.—In the northern part of the Great Basin, Nemophila breviflora has a wide distribution. It occurs in Nevada and Utah, ranging northwards into Wyoming, Montana, Idaho, eastern Oregon and eastern Washington, thence extending into British Columbia. As in the case of many plants of the Great Basin flora, it enters the northeastern borders of California and has been found in the following localities in the Warner Mts. of eastern Modoc Co.: Twelve-mile Creek, *Manning;* Thoms Creek, *Constance* 2332. The cotyledons, ¾ to 1¼ inches long, are remarkable for size and persistence; in size their blades are 3 to 4½ lines wide, in duration they function until anthesis or beyond.

Refs.—NEMOPHILA BREVIFLORA Gray, Proc. Am. Acad. 10:315 (1875), type loc. mts. of Utah, *Watson* 869. *Viticella breviflora* Mcbr., Contrib. Gray Herb. 59:32 (1919).

3. **ELLISIA** L.

Annuals, similar to Nemophila. Leaves opposite (at least the lower), pinnately once parted. Flowers bractless, in axillary peduncled racemes or sometimes solitary and axillary or terminal. Calyx usually much enlarged in fruit, without bract-like appendages at the sinuses, but often with the sinuses distended into spreading horn-like or trough-like structures. Corolla white or blue, campanulate or rotate, the internal scales conspicuous or minute or none. Ovules 4 to 8. Seeds not carunculate.—Species 7, North America. (John Ellis, English botanist of the 18th century, whom Linnaeus called "a bright star of natural history").

Species relationships.—Ellisia membranacea is in aspect so much like a Nemophila that in the field it is constantly mistaken for a species of that genus by the unwary. In certain marked respects it resembles plants long known as Nemophila aurita and N. racemosa. These three species are alike habitally and in leafage. They are also alike in inflorescence. The flowers are borne in loose 2 to 5-flowered peduncled racemes which arise from the axil of the leaf set at the base of the terminal single-flowered peduncle. In all three species the seed is probably destitute of caruncle. Ellisia membranacea differs markedly, however, from these other two species in that its corolla is destitute of scales, its calyx is extremely different and is destitute of appendages. Its calyx, indeed, is very similar to the calyx of Eucrypta chrysanthemifolia. Ellisia membranacea is, however, so near Ellisia nyctelea, the type of the genus Ellisia, that this nearness constrains retention of Ellisia membranacea in Ellisia. Ellisia membranacea resembles Ellisia nyctelea not only in habit, leafage and flowers but the corolla in both is destitute of scales, in both the seeds have no caruncle. According to Asa Gray (Syn. Fl. 2:157) the peduncles of Ellisia nyctelea may be 1-flowered or racemosely flowered. Perhaps it were in the interests of a sounder phylogeny to reduce Nemophila to Ellisia, which would in such case be markedly homogeneous in habit and aspect and without any decisive technical cleavage. Eucrypta chrysanthemifolia in any case stands apart; it differs so sufficiently from either Nemophila or Ellisia that the acceptance by E. L. Greene (in 1885) and L. Constance (in 1938) of Nuttall's genus Eucrypta is well taken.

Calyx without appendages, its lobes round-obovate; corolla-scales none; stems obscurely or minutely scabrous, or the roughish points obsolete..1. *E. membranacea.*
Calyx with the sinuses distended into spreading trough-like appendages, its lobes triangular-lanceolate; corolla-scales present; stems armed with retrorsely curved prickles.
  Petioles broadly winged and auriculate-clasping; corolla 8 to 11 lines wide..............2. *E. aurita.*
  Petioles not broadly winged nor auriculate-clasping; corolla 2 to 3 lines wide....3. *E. racemosa.*

1. **E. membranacea** Benth. (Fig. 397.) Stems procumbent, 1 to 2 feet long; herbage glaucous, the leaves glabrous or slightly hispid or scaberulous with a few short scattered stiff hairs, the stems glabrous or rarely (but the pedicels usually) with a few minute recurved prickles on the angles; leaf-blades ovate in outline or often nearly as broad as long, 1 to 5 inches long, pinnately divided, with 2 broad lobes (obtuse at apex and broadest at base) spreading at right angles to the terminal lobe, or often with 4 to 8 similar lateral lobes, the lobes remote; petioles wing-margined; racemes loosely 2 to 4-flowered, appearing as if terminal, but in reality borne in the axil of the leaf at the base of a truly terminal 1-flowered peduncle; calyx without appendages, its lobes thinly ciliate-bristly; corolla white with 1 (to 3) small lance-shaped purple spots in the center of each lobe, 2 lines broad, no scales in the throat but with 10 glandular elevations; capsule often purple in age, with several muricate prickles, 1 or 2-seeded; seed globose, reticulated.

Shady places on wooded slopes in the foothills or in boulder pockets of desert ranges, 10 to 3500 feet: South Coast Ranges (mostly the inner range) from Contra Costa Co. to San Luis Obispo Co.; San Joaquin Valley (along streams); Sierra Nevada foothills from Stanislaus Co. to Kern Co.; Tehachapi Mts.; Mohave and Colorado deserts; cismontane Southern California. South to Lower California. Mar.-June.

Locs.—Coast Ranges: Antioch (foothills near), *Davy* 989; Corral Hollow, n. Mt. Hamilton Range, *Jepson* 9585; Evergreen, s. of San Jose, *Davy* 52; Jamesburg, Carmel Valley, *Constance & Hoover* 2054; Little Rabbit Valley, San Benito Co., *Jepson* 16,131; Paso Robles, *Condit & White;* Alcalde, sw. Fresno Co., *T. Brandegee.* San Joaquin Valley: Oakdale (4 mi. s.), Stanislaus Co., *Hoover* 337; Barris Hill. ne. of Dinuba, *H. P. Kelley;* Tulare, *Davy.* Tehachapi Mts.: Keene, *MacFadden* 59c; Bena sta. (e. of), *Allison Krames.* Sierra Nevada foothills: La Grange, Stanislaus Co., *Hoover* 1706; Citrus Cove, Fresno Co., *I. T. Walker;* Middle Tule River, Tulare Co., *Purpus* 5080; lower Kern Cañon, Greenhorn foothills, *Allison Krames.* Inyo Co.: Johnson Cañon, Panamint Range, *Jepson* 19,781. Mohave Desert: Waterloo Wash, Old Dad Mts., *Jepson* 20,524; Granite Mts. (sw. of Avawatz Mts.), *Jepson* 17,293; Newberry (lava sw. of), *Newlon* 511; Ord Mt., *Jepson* 5871; Coolgardie Yucca Mesa, *Jepson* 6629; Hawes sta., *Newlon* 487; Willow Sprs., 8 mi. w. of Rosamond, *Munz* 10,029. Colorado Desert: Cabezon, San Gorgonio Pass, *Parish;* Mission Creek, nw. of Garnet sta., *Clary* 1616; Andreas Cañon, San Jacinto Mts., *Newlon* 434; Deep Cañon, Santa Rosa Mts., *Clary* 1617; Grapevine Cañon, e. San Diego Co., *T. Brandegee.* Cismontane S. Cal.: Cuyama Valley, n. Santa Barbara Co., *Eastwood;* Riverside, *Jepson;* Cuyamaca Mts., *Newlon* 363; La Jolla, *Chandler* 5129.

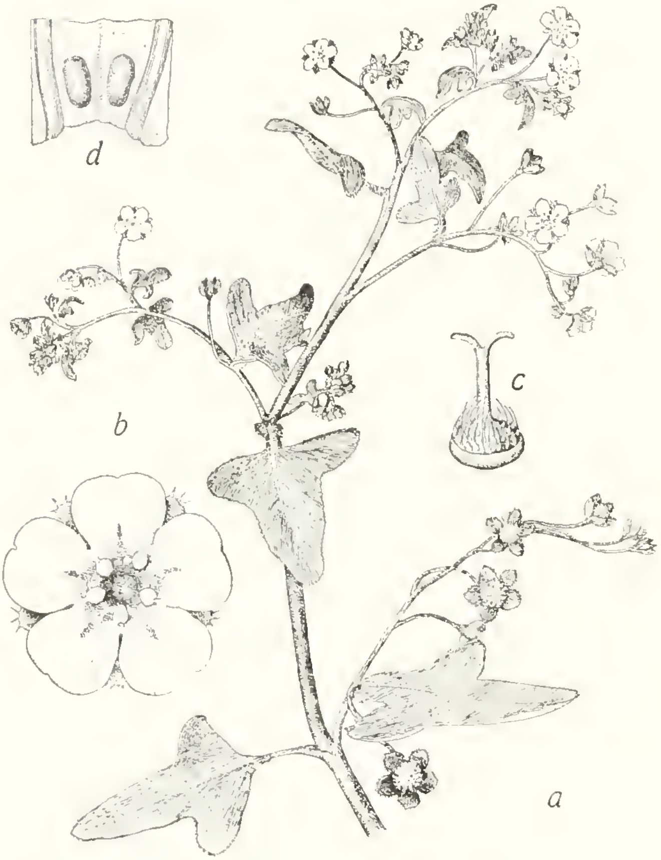

Fig. 397. ELLISIA MEMBRANACEA Benth. *a*, fl. branch, × 1⅓; *b*, fl., × 7; *c*, pistil, × 22; *d*, gland, × 28.

Refs.—ELLISIA MEMBRANACEA Benth., Trans. Linn. Soc. 17:274 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 435 (1901), ed. 2, 339 (1911), Man. 814, fig. 785 (1925). *Macrocalyx membranaceus* Ktze., Rev. Gen. Pl. 1:434 (1891). *Nemophila membranacea* Greene, Man. Reg. S. F. Bay 252 (1894). *E. membranacea* var. *hastifolia* Brand; Engler, Pflzr. 4^{251}:38 (1913), type loc. Cedar Mt., Mt. Hamilton Range, *Elmer* 4438. *Pholistoma membranaceum* Constance, Rhod. 42:39 (1940).

2. **E. aurita** (Lindl.) Jepson comb. n. FIESTA FLOWER. CLIMBING NEMOPHILA. Stem weak and straggling, 2 to 6 feet long, angled or winged, the angles or wings, and commonly the midribs of the leaves beneath, armed with retrorse prickles which enable the plant to climb over other plants; herbage puberulent; leaf-blades 1 to 3 (or 6) inches long, coarsely, unequally and irregularly pinnately parted into 3 to 7

lobes, the lobes ½ to 1½ inches long, often a little downwardly curved, the petioles broadly winged and conspicuously auriculate-clasping; racemes 2 to 5-flowered, peduncled, borne in leaf axils at the base of terminal 1-flowered peduncles; corolla deep purple or violet, paler outside, basin-shaped, the throat constricted just below the top, the spreading limb 6 to 13 lines broad; scales broad or semi-fanshaped, the pairs slightly joined over the base of the filaments, diverging upward and wholly adnate, slightly toothed or ciliate; capsule globose, 6-seeded, the seeds globose, foveolate-reticulate.

Moist shady places in the foothills, 100 to 3000 feet: Coast Ranges (mostly near the coast) from Marin Co. to San Luis Obispo Co.; east side of the San Joaquin Valley; Sierra Nevada foothills from Calaveras Co. to Kern Co.; cismontane Southern California. Mar.-May.

Field note.—The foliage leaves spread horizontally and are remarkably rigid for an Ellisia. This feature seems useful to the climbing habit and is complementary to the weak stems. The bractlets of the calyx are reflexed during anthesis but spread rotately in the fruiting phase.

The corolla, sometimes deep purple, sometimes pale blue and bordered by a narrow whitish zone at base, attracts the interest of the botanical traveler, both for its structural peculiarities and its pleasing color tones. While California was still a province of Spain, the young beauties of the Spanish people at Santa Barbara decorated dresses for festivals with the flowers of this species, which readily cling to fabrics by their hooked spines.

Locs.—Coast Ranges: Angel Isl., Marin Co., *Chesnut;* Sycamore Cañon, Mt. Diablo, *Bowerman* 722; Niles Cañon, Alameda Co., *Chesnut & Drew;* Stanford, *C. F. Baker* 399; San Jose Cañon near Carmel Bay, *E. Ferguson* 324; Mt. San Luis, *Summers.* San Joaquin Valley (east side): Stockton, *Sanford* 188; Modesto, *Hoover* 369; Tulare, *Davy.* Sierra Nevada foothills: Telegraph City (3 mi. ne.), Calaveras Co., *Rutter* 126; Columbia, Tuolumne Co., *A. L. Grant* 679; Knights Ferry, ne. Stanislaus Co., *Hoover* 781; Mariposa Creek, Mariposa Co., *Constance* 2128; Kelshaw Corners (3 mi. sw.), Madera Co., *Constance* 2201; Tollhouse, Fresno Co., *Constance* 2214; betw. Dunlap and Pinehurst, s. Fresno Co., *Newlon* 147; Limekiln Creek, Tulare Co., *Jepson* 2790; Kernville, *T. Brandegee.* Cismontane S. Cal.: Los Alamos, n. Santa Barbara Co., *Jepson* 8449; Santa Barbara, *Jepson* 9120; Monrovia Cañon, San Gabriel Mts., *Peirson* 441; Santa Catalina Isl. (Erythea 7:142); San Clemente Isl., *Murbarger* 7; Santa Ana Mts., *Alice King;* Mt. Soledad near La Jolla, San Diego Co., *Newlon* 317.

Refs.—ELLISIA AURITA Jepson. *Nemophila aurita* Lindl., Bot. Reg. t. 1601 (1833), type from Cal., *Douglas;* Sweet, British Fl. Gard. n. ser. 4: t. 338 (1838); Jepson, Fl. W. Mid. Cal. 434 (1901), ed. 2, 337 (1911), Man. 812 (1925). *Viticella aurita* Mcbr., Contrib. Gray Herb. 59:29 (1919). *Pholistoma auritum* Lilja, Bot. Notiser 1839:40 (1839).

3. **E. racemosa** (Nutt.) Jepson comb. n. Stems weak, simple or branched, ⅓ to 1⅓ feet long; herbage hispid or bristly-hispid, the stems retrorsely so with the short thorn-like bristles scattered; leaf-blades round-ovate in outline, mostly very coarse, 1 to 2 inches long, pinnately parted, the ovate or oblong lobes entire or toothed; flowers solitary on a terminal peduncle, its basal leaf with a 2 to 5-flowered raceme in its axil; corolla white to lavender, open-campanulate, 2 to 3 lines wide, 1½ times as long as the calyx; scales narrow, the pairs joined at base, at apex with 2 or 3 free laciniae; capsule globose, shorter than the calyx, 1 to 8-seeded; seeds angular-subglobose, foveolate.

Hillslopes and ravines, 50 to 800 feet: Santa Barbara Islands; coastal San Diego Co. South to Lower California. Mar.-Apr.

Locs.—Santa Barbara Isls.: Prisoners Cove, Santa Cruz Isl., *Mabel Peirson;* Avalon, Santa Catalina Isl., *Condit;* San Clemente Isl., *Murbarger* 76b. San Diego coast: Mt. Soledad, *Newlon* 282; San Diego, *T. Brandegee.*

Refs.—ELLISIA RACEMOSA Jepson. *Nemophila racemosa* Nutt.; Gray, Proc. Am. Acad. 10: 315 (1875), type loc. San Diego, *Nuttall;* Jepson, Man. 812 (1925). *Viticella racemosa* Mcbr., Contrib. Gray Herb. 59:30 (1919).

4. **EUCRYPTA** Nutt.

Annuals. Leaves once to three times pinnately divided or dissected or toothed. Petioles, except the lowest, auriculate-dilated at base. Calyx deeply parted, its lobes elliptic or oval, accrescent, without appendages. Flowers in loose axillary and terminal racemes. Corolla white or purple, bowl-shaped, nearly equaling to twice as long as the calyx. Ovary 1-celled; style 2-cleft. Capsule with dilated membranous placentae lining each valve, the seeds mostly borne on the face of the placentae, but usually also 1 or 2 borne on the back of each placenta, that is between the placenta and the valve.—Species 2, southwestern United States and northern Mexico. (Greek, eu, true, and crypta, secret, referring to the extra hidden seeds.)

Leaves mostly opposite, 2 to 3 times pinnately parted and dissected; seeds on the front and back of the placentae unlike; pedicels and calyx without glands (except in var.); erect plants; cismontane and transmontane........................1. *E. chrysanthemifolia.*
Leaves alternate, once pinnately parted, the lobes mostly entire or with one tooth; seeds in the capsule all alike, corrugated; pedicels and calyx with short-stipitate glands; diffuse plants; transmontane deserts........................2. *E. micrantha.*

1. **E. chrysanthemifolia** Greene. Stem erect, freely branching, ½ to 2 feet high; herbage thinly spreading-hirsute, or the leaves thinly hispidulous; leaf-blades ovate in outline, 2 to 4 inches long, twice to thrice pinnately divided with the segments once or twice pinnately dissected or toothed (a little fern-like), shortly petioled or sub-sessile, the petioles with a conspicuous auriculate dilation at base; racemes loosely several to many-flowered; calyx-lobes oval; corolla open-campanulate, 1½ to 2 times as long as the oval calyx, its scales a diverging pair to each stamen; capsule whitish, thinly hirsute, the placentae lining and exactly conforming to the valves; placentae with 2 roughened seeds borne on the front of each, and 2 smooth ones concealed behind each, that is, between the placentae and the valves.

Moist open spots in the foothills or in shady situations, 10 to 3000 (or 5000) feet: Coast Ranges from Contra Costa and Marin Cos. to San Luis Obispo Co.; cismontane Southern California. South to Lower California. Mar.–May.

Locs.—South Coast Ranges: Crockett, Contra Costa Co., *Tidestrom;* Black Hills, Mt. Diablo, *Jepson* 10,690; Fish ranch, Berkeley Hills, *Jepson* 21,003; Angel Isl., San Francisco Bay, *Chesnut & Drew;* Niles Cañon, *Constance* 2236; Alum Rock, Mt. Hamilton Range, *Elmer* 4731; Willow Creek School (s. of), San Benito Co., *R. S. Ferris* 8357; Carmel Mission, *Heller* 6526; Limekiln Creek, Santa Lucia Mts., *Jepson* 1674; San Luis Mt., San Luis Obispo Co., *Summers.* Cismontane S. Cal.: Canada del Capitan, Santa Barbara coast, *Jepson* 11,906; Santa Cruz Isl., *T. Brandegee;* Sycamore Cañon, Santa Ynez Mts., *Jepson* 9131; Santa Catalina Isl., *T. Brandegee;* Newport Bay, Orange Co., *L. M. Booth* 1063; Santa Ana Cañon, Orange Co., *J. T. Howell* 2566; Rubio Cañon (foothills e.), San Gabriel Mts., *Peirson* 167; San Bernardino foothills, *Parish;* Riverside, *Jepson* 21,004; San Jacinto Valley, *Jepson* 1263; San Jacinto River Cañon, San Jacinto Mts., *Jepson* 1277; Escondido, San Diego Co., *C. V. Meyer* 15; San Pasqual Valley, San Diego Co., *Jepson* 19,177; Ramona, San Diego Co., *Jepson* 8520; Mt. Soledad, San Diego Co., *Newlon* 281. Colorado Desert: Santa Rosa Mts. (12 mi. sw. of Indio), *Clary* 1618.

Var. **bipinnatifida** Constance comb. n. Herbage thinly villous or bristly-hirsute, somewhat glandular; corolla barely exceeding or shorter than the calyx.—Southern Sierra Nevada in Kern Co.; Inyo Co.; central and eastern Mohave Desert; Colorado Desert. East to Arizona, south to Lower California.

Locs.—S. Sierra Nevada in Kern Co.: Democrat Sprs. (6 mi. w.), lower Kern Cañon, *Constance* 2121. Inyo Co.: Bishop (foothills s.), *Heller* 8227; Johnson Cañon, Panamint Range, *Jepson* 19,778. Mohave Desert: Granite Mts., s. of Avawatz Mts., *Jepson* 17,277; Poison Cañon near Searles Lake, *Constance* 2114; Randsburg, *Heller* 7682; Sheephole Mts., *Munz* 13,818; Deadman's Pt., near Victorville, *Parish* 10,634. Colorado Desert: Corn Sprs., e. Riverside Co., *Hitchcock* 12,200; La Quinta Cañon, 7 mi. w. of Coachella, *Clary* 1614; Borrego Sprs., *T. Brandegee;* San Felipe Valley, e. San Diego Co., *Jepson* 12,443; Vallecito (head of), e. San Diego Co., *Jepson* 8635.

Refs.—EUCRYPTA CHRYSANTHEMIFOLIA Greene, Bull. Cal. Acad. 1:200 (1885). *Ellisia chrysanthemifolia* Benth., Trans. Linn. Soc. 17:274 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 435 (1901), ed. 2, 339 (1911), Man. 815 (1925). *Macrocalyx chrysanthemifolius* Ktze., Rev. Gen. Pl. 1:434 (1891). *Eucrypta paniculata* Nutt., Jour. Acad. Phila. ser. 2, 1:159 (1847), type loc. Santa Catalina Isl., *Gambel.* *Eucrypta foliosa* Nutt., l.c., type loc. Santa Catalina Isl., *Gambel.* Var. BIPINNATIFIDA Constance. *Phacelia micrantha* var. *bipinnatifida* Torr., Bot. Ives 21 (1860), type loc. Yampai Valley, Sitgreaves Pass, Black Mts., w. Ariz., *Ives.* *Macrocalyx bipinnatifidus* Cov., Contrib. U. S. Nat. Herb. 4:157 (1893). *Ellisia torreyi* var. *bipinnatifida* Brand; Engler, Pflzr. 4^{251}:42 (1913). *Ellisia torreyi* Gray, Proc. Am. Acad. 20:302 (1885), based on Phacelia micrantha var. bipinnatifida Torr.; Jepson, Man. 815 (1925). *Eucrypta torreyi* Hel., Cat. N. Am. Pl. 7 (1898).

2. **E. micrantha** Hel. Stems erect, slender, branching from the base, slightly glandular-pubescent or subglabrous, 3 to 10 inches high; leaf-blades oblong in outline, ½ to 1 inch long, pinnately parted, the lobes entire or rarely 1-toothed; lower leaves petioled, the upper auriculate-dilated at the sessile base; racemes several-flowered, sub-paniculate; corolla white or purple, deeply bowl-shaped, 1 to 1½ lines long, the lobes orbicular or transversely quadratish, obtuse or emarginate, the throat with a yellowish spot between the filaments; stamens unequal, 3 longer; seeds 6 to 21, transversely corrugated, mostly borne on the face of the placentae, usually 1 or 2 behind each placenta.

Moist rock crevices or under scrub in desert cañons, 300 to 7500 feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. East to Utah and Texas, south to Mexico. Apr.-May.

Locs.—Inyo Co.: Argus Range (n. end), *Jepson* 19,556; Johnson Cañon, Panamint Range, *Jepson* 19,603; Bradbury Well, s. end Black Mts., *Peirson* 7785. Mohave Desert: near Bicycle Lake, Tiefort Mt., *Jepson* 20,344; Willow Spring Cañon, Old Dad Mts., *Jepson* 20,444; Goffs, *Newlon* 534. Colorado Desert: Palm Cañon, San Jacinto Mts., *Newlon* 453; La Quinta Cañon, Coachella (7 mi. w.), *Clary* 1615; Vallecito, e. San Diego Co., *Jepson* 8581.

Refs.—EUCRYPTA MICRANTHA Hel., Muhl. 2:163 (1906). *Phacelia micrantha* Torr., Bot. Mex. Bound. 144 (1859), type loc. El Paso, Tex., *Bigelow*. *Ellisia micrantha* Brand; Engler, Pflzr. 4^{251}:42 (1913); Jepson, Man. 815 (1925). *Macrocalyx micranthus* Cov., Contrib. U. S. Nat. Herb. 4:157 (1893). *Nyctclea micrantha* Woot. & Sta., Contrib. U. S. Nat. Herb. 19:535 (1915).

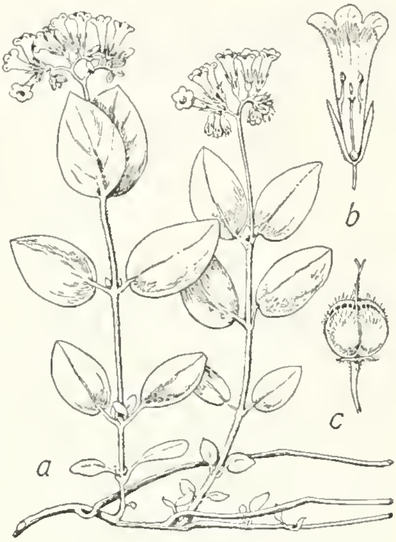

Fig. 398. DRAPERIA SYSTYLA Torr. *a*, portion of fl. stem, × ½; *b*, long. sect. of fl., × 1½; *c*, capsule, × 2.

5. DRAPERIA Torr.

Low diffuse perennial herb with slender stems and opposite entire leaves. Flowers in a terminal cyme, its branches consisting of unilateral racemes. Calyx-segments linear, elongated in fruit. Corolla pale lavender, tubular-funnelform, without scales. Stamens unequal and unequally inserted low on the corolla-tube, included. Ovary 2-celled, the ovules in each cell 2, pendulous. Style long, filiform, 2-cleft at apex. Capsule subglobose.—Species 1. (J. W. Draper, American historian.)

1. **D. systyla** Torr. (Fig. 398.) Stems few or several, 4 to 7 (or 16) inches long, arising from the horizontal rooting branches of a large root-crown; herbage silky-hirsute; leaf-blades ovate, entire, ¾ to 1¾ inches long, shortly petioled; corolla pubescent outside, 5 to 6 lines long; filaments slightly hairy on lower half; ovary densely hairy.

Loose loam soil of pine woods and crevices in rocky walls or on talus drift, often forming colonies a few feet broad, 3500 to 6000 feet: Sierra Nevada from eastern Siskiyou Co. to Tulare Co.; North Coast Ranges in Trinity Co. June-July.

Locs.—Sierra Nevada: Shasta Sprs., Siskiyou Co., *Jepson* 20,995; Blue Cañon, Placer Co., *H. A. Walker* 1361; Hetch-Hetchy, *A. L. Grant* 810; Nevada Fall, Yosemite, *Jepson* 3138a; Sequoia Lake, near Millwood, *H. P. Kelley;* Giant Forest, *W. Fry* 328; Cedar Creek, Tulare Co., *Jepson* 602; Garfield Forest, South Fork Kaweah River, *Jepson;* South Fork Middle Tule River, *Jepson*. Trinity Co.: Noble's ranch, New River, *Jepson;* Devils Backbone, betw. Salmon Summit and Trinity Summit, *Jepson* 2070.

Refs.—DRAPERIA SYSTYLA Torr.; Gray, Proc. Am. Acad. 7:401 (1868); Jepson, Man. 815 (1925). *Nama systylum* Gray, l.c. 6:37 (1866), type from Cal., *Lobb* 164. *D. systyla* var. *minor* Brand, Univ. Cal. Publ. Bot. 4:214 (1912), type loc. Coffee Creek, Trinity Co., *Hall* 8545.

6. **PHACELIA** Juss.

Perennial or annual herbs of marked aspect, with alternate leaves (or sometimes the lower opposite). Flowers blue, violet or white, usually in scorpioid racemes, the racemes often spike-like. Calyx of 5 nearly distinct lobes, commonly accrescent. Corolla funnelform, tubular, campanulate or nearly rotate, promptly deciduous (in nearly all species), the tube commonly with 10 internal lamellate projections or scales. Stamens equal or unequal, but equally inserted on or near the base of the corolla, rarely high on tube when the tube is short. Style 2-cleft at apex or half-way, rarely ⅝. Capsule 1-celled, or nearly or quite 2-celled by the approximation or union of the placentae in the axis, 2-valved, the thin septa-like placentae adherent to the valves. Seeds reticulate-pitted or favose or transversely corrugated.—Species about 120, North and South America. (Greek phakelos, a cluster, many species with crowded flowers.)

Bibliog.—Willis, J. C., Fertilization of Phacelia (Jour. Linn. Soc. Bot. 30:53–60, pl. 3, figs. 3–13,—1895). Parish, S. B., Southern California forms of Phacelia circinata Jacq. (Zoe 5:9–11,—1900). Greene, E. L., Some Phacelia segregates (Pitt. 5:17–23,—1902). Dundas, F. W., Revision of the Phacelia californica group for North America (Bull. S. Cal. Acad. 33:152–168,—1935). Voss, J. W., Revisional study of the Phacelia hispida group (Bull. S. Cal. Acad. 33: 169–178,—1935); A revision of the Phacelia crenulata group for N. Am. (Bull. Torr. Club 64:81–96, 133–144,—1937).

Variation in Phacelia.—Notwithstanding the great inconstancy in this group, the species are fairly well differentiated by recognizable marks. They are not hopelessly obscured by fluctuating variability. There is much variation in habit, but in some species, as Phacelia parishii, habit is distinctive. Leafage is often extraordinarily inconstant but in most species fluctuation is confined within the limits of a leaf-type peculiar to the species. The inflorescence is less dependable but the arrangement of the racemes, the length and position of the pedicels, or the position of the fruiting calyces often furnish distinctive characters. The size of the corolla often fluctuates markedly in a single collection, but its structure may give a character for the species, while inclusion or extrusion of the stamens is a useful point. The scales, as to form and attachment, may be peculiar to a species or to a group of species. The surface sculpturings of seeds yield dependable marks for differentiation.

It is not to be considered that the species of this genus as described are of equal value, but only approximately. To a noticeable degree species in the groups occur in pairs, in what may be called major and minor strains. Such pairs are represented by Phacelia malvaefolia and P. rattanii, Phacelia cicutaria var. hispida and P. cryptantha, Phacelia tanacetifolia and P. distans. In other cases the strains of the pair may be so shadowy that only one name has been applied to the whole. All the species here described may pass as primary species or as primary groups, save only that one described as Phacelia magellanica which represents an extensively large complex, both morphologically, geographically and ecologically.

A. Seeds commonly reticulate or favosely pitted, not transversely corrugated.

I. COROLLA SCALES PRESENT, ADNATE TO THE COROLLA-TUBE OR COMMONLY SO.—Subgenus EUPHACELIA.

1. Perennials.

a. Ovules 2 to each placenta; corolla commonly white.

Flowers many to numerous in the raceme; leaves entire or simply pinnately parted or divided and the lobes entire; for the most part coarse plants with stout stems 1 to 3½ feet high.
  Herbage hirsute and pubescent; perennials, rarely biennials.
    Leaf-blades commonly entire, the densely silky pubescence on upper side conspicuously grooved along the lateral ribs; sand-dunes, Del Norte coast..........1. *P. argentea.*
    Leaf-blades pinnatifid with usually large terminal lobe, or entire with 1 to several supplementary lobes at summit of petiole, or wholly entire, pubescent or hirsute, not grooved on upper side; hill country or montane or high-montane, frequent, usually in dry or rocky places, widely distributed......................2. *P. magellanica.*
  Herbage hispid-bristly with stinging hairs; leaf-blades entire or with a pair of supplementary lobes at base; biennial; plants of shady moist places............................3. *P. nemoralis.*
Flowers few in the raceme; corolla 5 to 7 lines wide; plants 2 to 4 inches high, the leaves entire; ne. Trinity Co..4. *P. dalesiana.*

b. Ovules several to many to each placenta.

Leaf-blades 2 to 6 lines long, orbicular (as broad as long); main stems white-woolly below; Death Valley ranges..5. *P. perityloides.*

Leaf-blades much larger (1 to 7 inches long), longer than broad; stems never white-woolly.
Corolla-lobes revolute; stamens strongly exserted.
Stem usually branched, 4 to 10 inches high; leaf-blades coarsely toothed or somewhat incised, sometimes lobed toward base; racemes short, crowded in a small head-like cyme; corolla-lobes revolute on the sides and thus pointed; Sierra Nevada. 6. *P. hydrophylloides.*
Stem simple, 3 to 7 feet high; leaf-blades pinnatifid; racemes mostly crowded towards summit of stem, the panicle rather large; corolla-lobes revolute all around; mts. of n. Cal............7. *P. procera.*
Corolla-lobes plane; stems ⅓ to 2 feet high.
Stem branched, sometimes simple; herbage hirsute and glandular above; leaf-blades coarsely toothed or cleft, sometimes with 1 to 4 supplementary lobes at base; stamens little or not at all exserted; north coast............8. *P. bolanderi.*
Stem simple; herbage canescent or puberulent, not glandular; leaf-blades pinnatifid; stamens strongly exserted; Modoc Co............9. *P. sericea.*

2. Annuals (except no. 21).

a. Ovules 2 to each placenta (1 to 6 in P. racemosa, P. pringlei and P. malvaefolia).

* Leaves entire or pinnately parted with entire lobes; stems 1½ to 9 inches high; corolla commonly blue or whitish.

Leaves alternate.
Leaves, at least the lower, incisely lobed or parted.
Racemes scorpioid, the flowers subsessile; corolla nearly 2 times as long as calyx; style glabrous; inner South Coast Range............10. *P. breweri.*
Racemes not scorpioid or scarcely; corolla little exceeding calyx; style slightly hairy at base; San Gabriel Mts. and Sierra Nevada in Kern Co............11. *P. lobata.*
Leaves entire or essentially so (or at least most of the leaves entire).
Corolla deciduous.
Racemes loose, flexuous, the axis very slender, the capsules remote; flowers ¾ to 1½ lines long, borne on spreading pedicels; Sierra Nevada............12. *P. eisenii.*
Racemes dense or moderately dense, not flexuous; flowers 1½ to 2½ lines long, borne on ascending pedicels.
Stems hirsute; leaves thin, pallid; style cleft nearly ½; Sierra Nevada, e. slope............13. *P. humilis.*
Stems glandular-hirsute; leaves thick, dark green; style cleft more than ½; Sierra Nevada, w. slope............14. *P. dociana.*
Corolla long-persistent, 2 times as long as calyx or nearly, its scales very long and narrow; flowers crowded, divaricately spreading; Nevada and Placer Cos.....15. *P. marcescens.*
Leaves opposite (at least the lower ones); racemes loosely flowered, not scorpioid or scarcely so; stamens included; stem slender, usually simple below and oppositely branched above.
Stem glabrous and glaucous below the branches; ovules 1 or 2 to each placenta; Sierra Nevada............16. *P. racemosa.*
Stem puberulent; ovules 2 to 5 to each placenta; North Coast Ranges............17. *P. pringlei.*

** Leaves cleft, parted or divided, the lobes or divisions always in some degree crenate or toothed.

Leaves with many to numerous leaflets or divided into numerous segments or discrete divisions.
Divisions of leaves mostly rather small (1 to 3 lines wide, rarely ½ or 1 inch wide), always sessile (except in P. umbrosa), commonly rather delicate with numerous teeth, lobes or scallops, the whole often more or less fern-like in appearance; pedicels ¼ to 1 line long (except in P. cryptantha), puberulent or thinly bristly, sometimes glandular.
Calyx with 1 to 5 of its lobes toothed, cleft or divided, 1 to 4 of the lobes often entire.
Calyx-lobes pinnately divided into spatulate divisions; racemes crowded in dense clusters; capsule regularly dehiscent; San Clemente Isl.....18. *P. floribunda.*
Calyx-lobes dimorphic, 3 narrow and entire, 2 conspicuously expanded and leaf-like, toothed or cleft, or one of the two entire; racemes in corymbose panicles; capsule membranous, not regularly dehiscent; Sierra Nevada foothills........ 19. *P. platyloba.*
Calyx-lobes all entire, all alike or essentially alike, at most merely unequal.
Calyx-lobes narrowly linear, lanceolate, oblanceolate or oblong, not becoming chartaceous.
Hairs of ovary and capsule soft, all essentially alike; fruiting pedicels rather firm.
Racemes (especially at maturity) ascending or erect in an umbel-like cluster above the foliage, very dense; corolla with erect or ascending lobes; stamens long-exserted; fruiting capsules erect; widely distributed, both cismontane and transmontane....20. *P. tanacetifolia.*

Racemes more or less divergent (especially at maturity), solitary or geminate, not separated from the foliage; corolla with spreading lobes; stamens included or exserted; fruiting capsules ascending.

Perennial with woody root-crown; corolla-scales long, with a small lateral lobe; widely distributed, both cismontane and transmontane........................21. *P. ramosissima.*

Annuals.

Leaves with the leaflets or divisions (at least the lower) petiolulate; rare, sw. Colorado Desert................22. *P. umbrosa.*

Leaves with the divisions sessile.

Calyx-lobes oblanceolate or lanceolate or oblong (usually one of the 5 obtuse), puberulent and hispid; corolla-scales short with a large lateral lobe; stems puberulent and hirsute; common and widely distributed, both cismontane and transmontane....23. *P. distans.*

Calyx-lobes mostly narrower and acute, puberulent and bristly, the bristles equal and regular, spreading horizontally; corolla-scales long, without a lateral lobe; stems puberulent and hispid; e. Mohave Desert and Inyo Co................................24. *P. vallis-mortae.*

Hairs of ovary and capsule of 2 kinds, a short minute pubescence mixed with more or less conspicuous bristles usually arising from dark spots; fruiting pedicels fragile (except in P. cicutaria var. heliophila); calyx and herbage markedly spreading-bristly; calyx-lobes very narrow; stamens included or little exserted.

Corolla 4 to 7 lines wide, longer than the calyx; fruiting pedicels ¼ to 1 line long; stamens about equaling corolla or a little exserted; Sierra Nevada foothills, inner South Coast Range and S. Cal......... 25. *P. cicutaria.*

Corolla 2 to 2½ lines wide, shorter than or equaling the calyx; fruiting pedicels 1½ to 2½ lines long; stamens included; transmontane deserts........................26. *P. cryptantha.*

Calyx-lobes broadly ovate to oblong, in fruit becoming chartaceous or firm.

Corolla bowl-shaped, much surpassing calyx; stamens equaling corolla; style long-exserted from fruiting calyx; cismontane Cal. and w. Mohave Desert........................27. *P. ciliata.*

Corolla tubular, hardly surpassing calyx; stamens included; style short, included in fruiting calyx; ne. Cal....................................28. *P. thermalis.*

Divisions of leaves large (mostly 1 to 2½ inches broad), mostly with petiolules; pedicels during anthesis 1 to 3 lines long, densely and regularly hirsute with long spreading hairs; stamens exserted; transmontane deserts..................................29. *P. pedicellata.*

Leaves merely toothed, lobed or cleft, not divided or seldom (except in P. crenulata).

Leaf-blades oblong to linear-oblong (or ovate), irregularly toothed or lobed, or some pinnately divided (at least below); calyx-lobes equal in length; stamens well-exserted; herbage hirsutulose or hirsute-hispid; transmontane deserts..............30. *P. crenulata.*

Leaf-blades round- or elliptic-ovate, shallowly lobed; calyx-lobes unequal; herbage bristly; Coast Ranges.

Racemes dense, many-flowered; stamens and style exserted....................31. *P. malvaefolia.*

Racemes slender, becoming loose, fewer-flowered; stamens and style included.................... 32. *P. rattanii.*

b. Ovules several to many to each placenta.

Calyx-lobes dorsally concave or with revolute margins; leaves bipinnately parted or divided; racemes congested in a terminal cymose panicle; plants robust (1 to 2 feet high); Santa Catalina and San Clemente islands........................33. *P. lyonii.*

Calyx-lobes plane, not revolute; racemes not densely congested; plants 2 to 12 inches high (to 1½ feet in P. linearis).

Pedicels curved or retrocurved-spreading in age.

Leaf-blades mostly pinnately parted or some subentire; style cleft at apex; cismontane from cent. Cal. to S. Cal........................34. *P. douglasii.*

Leaf-blades mainly entire (or the basal few-toothed or incised); style cleft ½ to ¾; transmontane, and also intramontane in ranges bordering the deserts.................. 35. *P. curvipes.*

Pedicels straight, short during anthesis (¼ to 1½ lines); leaves merely toothed or cleft or entire, sometimes parted or divided towards the base.

Leaves cordate or subcordate at base, at least the lower, the upper often broadly cuneate at base; Inyo Co. and e. Mohave Desert.

Corolla white, 1¼ to 1½ times as long as the calyx; leaf-blades mostly broader than long..........36. *P. rotundifolia.*

Corolla purple or pink, 2 times as long as the calyx; leaf-blades mostly longer than broad..........37. *P. mustelina.*

Leaves not cordate.

Leaves rather broad, mostly orbicular, ovate or broadly oblong.

Style bifid or cleft near the apex; stamens included.

Leaves entire or with 1 or 2 lobes or teeth near base.

Corolla funnelform or campanulate, 3 to 9 lines long, longer than the calyx; scales present, conspicuous.

Corolla blue.

Corolla 4 to 7 lines long; Coast Ranges..........38. *P. divaricata.*

Corolla 3 to 3½ lines long; Sierra Nevada....39. *P. congdonii.*

Corolla violet with white throat and tube, 3½ to 4 lines long; Santa Ana Mts..........40. *P. keckii.*

Corolla tubular, ¾ to 1¼ lines long, shorter than calyx; scales very narrow or none; Mono Co..........41. *P. saxicola.*

Leaves crenate or dentate; corolla 2 to 4 lines long.

Plants 7 to 12 inches high; corolla light blue; cent. Coast Ranges and Amador Co. foothills..........42. *P. suaveolens.*

Plants 3 to 10 inches high; transmontane deserts.

Stems few to several from the base, diffuse; corolla blue or bluish, its scales obscure or none; Mohave Desert..43. *P. parishii.*

Stems simple at base, strictly erect, branched above; corolla white, its scales long and narrow; ranges in and bordering the deserts..........44. *P. lemmonii.*

Style cleft to near the middle or below.

Divisions of style short, not exserted from corolla; inner South Coast Range..........45. *P. phacelioides.*

Divisions of style long, well-exserted from corolla.

Stamens exserted.

Corolla nearly white; ovules 5 or 6 to each placenta; Santa Lucia Mts..........46. *P. grisea.*

Corolla violet or pale blue; ovules 2 to 4 to each placenta; Sierra Nevada..........47. *P. purpusii.*

Stamens included; Tuolumne Co. to Mariposa Co..........48. *P. vallicola.*

Leaves rather narrow, linear or oblanceolate, mostly entire.

Herbage glandular-puberulent and spreading-hispid; racemes terminal on the branches in 1s and 2s; style cleft about ⅔; ranges bordering the deserts..........49. *P. mohavensis.*

Herbage minutely pubescent and usually spreading-hispid also; racemes short, disposed racemosely in a leafy panicle; style cleft ⅓; n. Cal..........
50. *P. linearis.*

II. COROLLA-SCALES NONE (THAT IS, NO PROPER SCALES ARISING FROM COROLLA); (CF. ALSO P. PARISHII); ANNUALS.

Filaments not dilated at base; corolla deeply saucer-shaped; ovules 25 to 60 on each placenta; along the coast from Monterey Co. to San Diego Co.—Subgenus GYMNOBYTHUS.

Corolla blue with white or purple center, mostly 6 to 9 lines broad; pedicels ¼ to 5 (or 9) lines long..........51. *P. viscida.*

Corolla pale blue or purplish without white center, ¾ to 2 inches broad; pedicels ½ to 2 lines long..........52. *P. grandiflora.*

Filaments with a dilation or with wings at base; pedicels 2 lines to 2¼ inches long.—Subgenus WHITLAVIA.

Corolla subrotatish to turbinate-campanulate, cleft about to middle.

Corolla deep violet, purple or blue, ¾ to 1¼ inches broad, the tube with 5 large whitish spots; ovules about 12 to 30 to each placenta.

Stem (main axis) slender, mostly ½ to 1¾ feet high, somewhat remotely leafy throughout; basal dilation of filaments not toothed; leaves thin; coastal S. Cal. and w. side of Colorado Desert..........53. *P. parryi.*

Stem (main axis proper) stout and short (1 to 3 inches long), densely leafy, bearing flowering branches 3 to 5 inches long; basal dilation of filaments with a spreading subulate tooth on each side; leaves thick; se. Inyo Co..........
54. *P. nashiana.*

Corolla white, 3 to 6 lines broad, the tube not spotted; ovules 5 to 8 to each placenta; coastal S. Cal..........55. *P. longipes.*

Corolla oblong-campanulate, shallowly cleft.
  Corolla a little ventricose, that is, slightly broader below than at throat; ovules 15 to 20 to each placenta; mainly coastal S. Cal.......56. *P. minor.*
  Corolla funnelform-campanulate, that is, much broader at throat than below; ovules 20 to 30 to each placenta; transmontane deserts.......57. *P. campanularia.*

B. Seeds transversely corrugated; corolla without scales or the scales very narrow or indistinct; ovules more than 2 to each placenta; annuals; transmontane deserts or mountain ranges bordering them (except P. brachyloba).—Subgenus Microgenetes.

Leaves pinnately divided or pinnatifid into many or numerous lobes or divisions, the divisions rather fine (½ to 4 lines long).
  Corolla small, shorter than or only slightly exceeding calyx.
    Calyx-lobes linear, slightly dilated and often recurved or spreading at apex; stems diffuse or ascending; transmontane deserts.......58. *P. ivesiana.*
    Calyx-lobes strongly spatulate, straight; stems erect; San Gabriel Mts. and w. side of Colorado Desert.......59. *P. affinis.*
  Corolla 2 to 3 times longer than calyx.
    Flowers 5 to 7 lines long; corolla-throat not bearing areolae; cismontane and transmontane.......60. *P. fremontii.*
    Flowers 3 to 4 lines long; corolla-throat with areolae; cismontane, Monterey Co. to San Diego Co.......61. *P. brachyloba.*
Leaves round-ovate, entire or crenate, not pinnatifid; stamens included; transmontane deserts.
  Leaves subcordate at base; style cleft ⅓ to ½; capsule globose, the fruiting calyx ⅘ to as long.
    Corolla 2 to 2½ lines long, 1¼ to 1¾ times as long as the calyx; compact dwarfs.......62. *P. pachyphylla.*
    Corolla 4 to 6 lines long, 2 to 3 times as long as the calyx; erect robust branching plants. 63. *P. calthifolia.*
  Leaves acute at base; style shortly cleft at apex; capsule oblong, ½ to ⅘ as long as the fruiting calyx; decumbent or procumbent plants.......64. *P. gymnoclada.*

I.—Subgenus Euphacelia. Corolla-tube with 10 scales, each attached by one side to the corolla-tube and by the other side to the base of the stamen; ovules 2 to 6 (or 8 to 200) to each placenta; seeds not transversely corrugated (or in a few species slightly so on one side).

1. **P. argentea** Nels. & Mcbr. Stems 4 to 14 inches high, decumbent or ascending, forming mound-like clumps, sparingly leafy or sometimes markedly leafy at base; leaf-blades elliptic to suborbicular, simple and entire (or rarely with a pair of supplementary leaflets at base), 1 to 1½ inches long, thick, densely silky-strigose, the upper side with the hairs impressed right and left between the lateral parallel ribs of the blade so as to make compact hirsute ridges with conspicuous furrows along the ribs between the ridges; under side of blades with the lateral ribs in relief and densely hirsute, the intervals pubescent or tomentulose; racemes in a dense subcapitate cluster; corolla white.

Coast-line sand dunes, 5 to 50 feet: Del Norte Co. North to Curry Co., southwestern Oregon. July.

Locs.—Crescent City, *Davy;* Pt. St. George, *Cooper* 129; Lake Earl, *Tracy* 16,371; Smith River Indian Reservation, *R. Van Deventer* 310. This sand dune plant is closely allied to various forms of Phacelia magellanica. The describable differences are mainly restricted to the peculiar distribution of the leaf hairs which results in marked furrows on the blades along the lateral ribs on the upper side.

Refs.—Phacelia argentea Nels. & Mcbr., Bot. Gaz. 61:34 (1916), type loc. Chetco, Ore., *Howell* 209, only the leaves described. *P. californica* var. *rotundata* Dundas, Bull. S. Cal. Acad. 33:156 (1935), type loc. Lake Earl, Del Norte Co., *Davy.*

2. **P. magellanica** Cov. Stems erect or ascending, few from a heavy root-crown, puberulent and spreading-hispid, ½ to 2 feet high; leaf-blades pinnatifid with distinct divisions, or the main blade ovate or oblong-ovate and entire with a pair of supplementary divisions at base or wholly entire; racemes dense, racemosely disposed or capitately congested; calyx-lobes linear or oblanceolate, hirsute and puberulent; corolla campanulate, 2 to 3 lines long; stamens exserted.

Mountain slopes, 100 to 8000 feet: Chile and Patagonia. Represented in North America only by varietal forms, those for California listed below.

Geog. note.—The binomial Phacelia circinata Jacq., the old-time name for this group of plants, rests initially upon Patagonian and Chilean specimens. The name was first extended to cover plants of western North America by Bentham (Trans. Linn. Soc. 17:279,—1837) who cited Phacelia heterophylla Pursh and P. californica Cham. as synonyms, but no argument was made as to the identity of the North American and South American forms. Nor did Asa Gray debate the matter; he accepts the name Phacelia circinata for North American plants (Proc. Am. Acad. 10:317,—1875) and in the Synoptical Flora (2:159,—1878) definitely makes it do duty from British Columbia to the Straits of Magellan. Purely as a matter of nomenclatorial mechanics, F. V. Coville substituted the name Phacelia magellanica Cov. for P. circinata, without touching the species concerned or the problems involved in the relationships, special morphology and geographic distribution of the group. A. Brand, in his monograph of the family (1913), uses the name Phacelia magellanica for both South American and North American plants and is the first to indicate adequately the great variety of forms in each geographic group, but he does not argue the specific identity of these plants of the northern and southern hemispheres.

Only a limited number of collections of Phacelia magellanica from Patagonia, Chile and Argentina are here available for study in connection with the work on Phacelias of this group in western North America. In habit and aspect the majority of these South American specimens would pass as Californian plants; they likewise display parallel variations. There are no observable differences between the racemes and flowers of Patagonian plants and North American plants or none that are constant.

In western America and especially in California a large number of forms of this group occur that by most authors of monographic revisions or monographic floras have been regarded as most suitably disposed as one species, though the binomial used has varied. In such massing of all these forms, the result is a broad species complex, here indicated as Phacelia magellanica, entirely different in content from practically all other species units in Phacelia. In western North America this complex covers a wide geographic area in which the forms or varieties composing it are, to a partial degree, segregated geographically. In California var. californica is of the central coast line. Var. calycosa (P. imbricata Greene), the most abundant and widespread form, occurs throughout the entire foothill area of cismontane California and is markedly variable. Towards the coast it blends with var. californica; in certain areas it passes indistinguishably into var. heterophylla (P. virgata Greene) which is of the North Coast Ranges inside the Redwood belt; at higher levels it passes into var. griseophylla. Var. griseophylla is characteristic of the Transition and Canadian zones in the Sierra Nevada; its stems are typically slender with long internodes, its leaves entire or sparingly pinnatifid and its racemes mostly few in a panicle; but on the whole it is eccentrically variable. It passes by intergrades into the var. frigida of the Hudsonian and Arctic zones, which is rather well characterized by its low caespitose habit, its basal tuft of entire leaves, its reduced or capitate panicle. Of the complex in California these are the most important and most outstanding forms geographically, although there are many others. If var. californica of the coast line be considered a convenient point for initiating comparisons, all the inland and high montane varieties represent departures in habit, in aspect, in size, in leaf form (especially as to a less or greater degree of lobation or incision) and in the number and arrangement of the racemes—all of which features are, however, markedly unstable. Phacelia magellanica would seem, in reality, an overloaded species, even as an admitted complex. The var. frigida in its extreme form is a reduced alpine 2 to 4 inches high, growing chiefly at altitudes of 8000 to 12,000 feet. At 13,000 feet on Mt. Whitney it is found at a higher altitude than any other hydrophyllaceous plant in North America and is in marked contrast with var. californica at sea-level on the coast line or the robust var. calycosa of the foothills. Var. frigida, then, with vars. californica, griseophylla and calycosa and the extremely unlike var. heterophylla with several other named varieties, are thus massed under one species designation, Phacelia magellanica, which seems out of keeping with usual species treatment.

Under the direction of the author, Virginia Bailey has dissected series of collections representing the forms var. californica, var. calycosa, var. griseophylla, var. frigida (and its high altitude strains vars. dasyphylla and pygmaea) and others. No essential differences are found amongst the flowers of any of these forms. In all there is considerable inconstant or continuous variation in the degree of hairiness of the filaments, the length of the filaments, the relative length of the style branches, the pubescence of the corollas both inside and out, and the relative length, shape and pubescence of the calyx-lobes. In all these varieties the corolla scales are essentially alike, that is, they are oblong, glabrous, wholly adnate to the corolla by one edge and to the very base of the filaments, the free margin at base usually connivent with the free margin of the scale of the adjacent pair. The ovate acute capsules are mostly 1 or 2 seeded. It must, in consequence, be said that all these forms are markedly alike in structure of the individual raceme, in structure of the corolla, in most essential features of the flower and in details of the fruit, and that most differences relate to unstable vegetative organs, that no one of the forms has a constant character, not even a vegetative one. Moreover, as said, all these named varieties intergrade and it is significant that the intergrades, to a rather marked degree, occupy a terrain which is intermediate between the areas of the various forms.

The type of P. magellanica has not been seen. On account, however, of the complex nature of the problem and by reason of insufficient knowledge of the South American plants and of the type of Phacelia magellanica, the name Phacelia magellanica, in view of these considerations, is reluctantly adopted for the North American complex. The various North American forms occurring in California are here described as follows:

Var. **calycosa** (Gray) Jepson & Bailey comb. n. Stems stout, 1 to 2½ feet high; herbage hirsute; leaf-blades 1 to 6 inches long, pinnately divided, the lateral segments lanceolate, ¼ to 1¼ inches long, the terminal segment ovate to lanceolate, 1 to 3 inches long; petioles about ½ to ¾ as long as the blades; racemes 2 to 4 inches long, borne on naked peduncles and disposed in an open or sometimes dense panicle 3 to 14 inches long; corolla dingy white, campanulate, 2½ to 4 lines long; fruiting calyces ovate or broadly oblong, more or less imbricated, often conspicuously so.—Dry rocky hills or flats, 100 to 3000 (or 4600) feet, mostly toward the interior; common throughout cismontane California at low altitudes from Shasta Co. through the Sierra Nevada foothills and Coast Ranges to San Diego Co. Apr.-June.

Locs.—Coast Ranges: Yreka, *Butler* 1356; Eighteen-mile Creek, Del Norte Co., *Van Deventer* 94; Horse Mt., ne. Humboldt Co., *Tracy* 7624; Van Duzen River Valley, Humboldt Co., *Tracy* 4112; Paskenta (5 mi. w.), sw. Tehama Co., *Virginia Bailey;* Stonyford, w. Colusa Co., *Jepson* 16,296; Willits, Mendocino Co., *Docia Patchett;* Round Valley, ne. Mendocino Co., *Tracy* 15,770; Bartlett Mt., n. Lake Co., *Jepson* 18,922; St. Helena (e. of), *Jepson* 21,049; Dutton Cañon, Vaca Mts., *Jepson* 21,050; Pellejo Hills, w. of Vanden, Solano Co., *Jepson* 21,052 (intergrading to var. heterophylla); Sonoma Valley, *Jepson* 4185; Benicia Hills, *Jepson* 18,884; Berkeley Hills, *Jepson* 9641; Mt. Diablo, *Jepson* 7611; Eva sta., e. slope Santa Cruz Mts., *Jepson* 21,054; Coyote sta., Santa Clara Valley, *Jepson* 21,047; Little Arthur Creek, w. of Gilroy, *Jepson* 9706; Lorenzo Creek, San Benito River, s. San Benito Co., *Jepson* 12,218; Mill Creek, Santa Lucia Mts., *Jepson* 1686; Santa Margarita, San Luis Obispo Co., *Summers.* Great Valley: Redding, *C. F. Rose* 277; Crane Creek, w. Tehama Co., *Jepson* 21,056; Big Antelope Creek (2 mi. e. of Andrews road sta.), e. Tehama Co., *Jepson* 16,627; College City, Colusa Co., *Alice King;* betw. Mossdale and Atlanta, San Joaquin Co., *Jepson* 21,055. Sierra Nevada: Table Mt., Butte Co., *Heller* 10,786; Newcastle, Placer Co., *Bolander* 4580; Sheep Ranch, Calaveras Co., *T. Brandegee;* Table Mt., near Jamestown, Tuolumne Co., *Tracy* 5696; Yosemite Falls, Yosemite, *Jepson* 4276 (calyx-lobes lanceolate); Hogan Creek, Mariposa Co., *Jepson* 12,817; Switchback, Kaweah River, *W. Fry* 337; Bear Creek, s. Tulare Co., *Purpus* 1751; Democrat Sprs., lower Kern River, *Jepson* 19,896. Intramontane and cismontane S. Cal.: Sisquoc River, n. Santa Barbara Co., *M. S. Baker;* Big Rock Creek, San Gabriel Mts. (n. slope), *Munz* 6875; Eaton Cañon, San Gabriel Mts., *Peirson* 164; San Bernardino, *Parish;* Palomar Mt., *T. Brandegee;* Witch Creek, San Diego Co., *Alderson* 7570; Julian, Cuyamaca Mts., *Cleveland.*

Var. **heterophylla** (Pursh) Jepson comb. n. Stems stout, simple, 1 to 25 from a basal rosette, usually erect, 1 to 3¾ feet high, densely leafy at base and leafy to the middle of the stem, thence with the many shortly peduncled ascending racemes compactly virgate-racemose to the summit; stem and petioles sparsely or densely spreading-hispid, puberulent beneath; leaf-blades pinnately divided to entire, appressed-pubescent; calyx-lobes linear; corolla white, 2 lines long.—Dry hills, rocky points and valley flats, (500 or) 2200 to 6900 feet: North Coast Ranges from Mendocino Co. to western Siskiyou Co.; northern Sierra Nevada on the west slope from Mariposa Co. to eastern Siskiyou Co., on the east slope from Mono Co. to Modoc Co. East to Nevada, north to Oregon and Idaho.

Geog. note.—The original specimen of Phacelia magellanica var. heterophylla (Pursh) Jepson, namely, Phacelia heterophylla Pursh, was collected by Meriwether Lewis "on dry hills on the banks of the Kooskoosky" River, that is the present Clearwater River, opposite Kamiah, Idaho. Of the original material, as preserved in the Herbarium of the Academy of Natural Sciences at Philadelphia, only a portion of an inflorescence and a few leaves remain (Meehan, Proc. Acad. Sci. Phila. 50:37). However, a collection, *Constance, Hedrick & Peters* 1897, made on Clearwater River opposite Kamiah, is believed by Lincoln Constance to be the only Phacelia species growing in the locality. If so, the number 1897 just cited is, therefore, to be regarded as a topotype. It is this specimen, then, which furnishes the basis for the course here taken that Phacelia virgata Greene of the California North Coast Ranges is in its fundamental characters quite the equivalent of Phacelia heterophylla Pursh of Idaho, which species of Pursh is in this work treated as a varietal subordinate of Phacelia magellanica.

Of those forms of Phacelia magellanica which have a considerable distribution, var. heterophylla (P. virgata Greene) is, in California, one of the most distinctive phases, though it intergrades with other forms on the margin of its distribution, especially with var. calycosa. Its distinctive character is, however, emphasized by its capacity to preserve its main features not only under a wide horizontal range but also under the climatic extremes of a wide altitudinal range. As an example, it occurs at 500 feet in the Trinity River valley at Willow Creek (*Tracy* 13,794) and, 19 miles distant, is found at 6900 feet on Salmon Summit (*Tracy* 14,385). These two localities fall within a narrow geographic area.

Locs.—North Coast Ranges: betw. Burns Valley and Borax Lake, Lake Co., *Hoover* 3548; Willits, cent. Mendocino Co., *D. I. Patchett;* Potter Valley, e. Mendocino Co., *Purpus;* Twin Rocks, Rattlesnake Creek, n. Mendocino Co., *Jepson* 16,728; Upper Look Prairie, Bull Creek, South Fork Eel River, *Constance* 731; Van Duzen River valley, opp. Buck Mt., *Tracy* 4252; Horse Mt., Humboldt Co., *Tracy* 7661; Sisson, Siskiyou Co., *Jepson* 21,058; Marble Mt. (summit s.), *Butler* 408; Yreka, *Butler* 1300. Cismontane Sierra Nevada: Hazel Green, Mariposa Co., *Jepson* 21,060; Hetch-Hetchy, *Jepson* 3418 (verging towards var. frigida); Downieville, Sierra Co., *M. O. Patchett;* Rich Gulch, Plumas Co., *Follett* 92; Keddie, Plumas Co., *Jepson* 4138; lava beds, ne. Shasta Co., *Hall & Babcock* 4233. Transmontane Sierra Nevada: Lundy, Mono Co., *Maud Minthorn* 59; Mono Lake, *Grinnell* 1065a; Boca, e. Nevada Co., *T. Brandegee;* Milford, Lassen Co., *T. Brandegee;* Fort Bidwell, ne. Modoc Co., *Manning;* Egg Lake, w. Modoc Co., *M. S. Baker;* Montague, e. Siskiyou Co., *Jepson* 19,983. Ore.: East Fork Illinois River, s. Josephine Co., *Jepson* 2937.

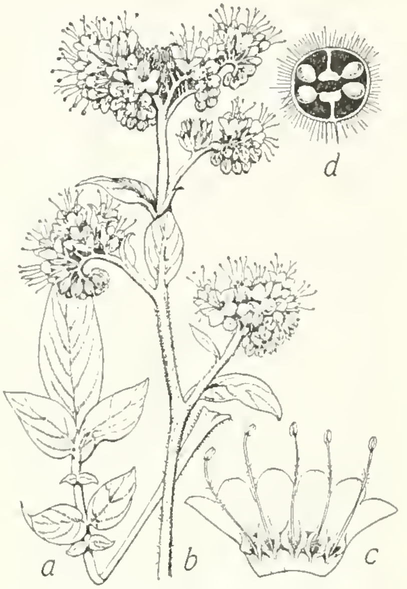

Fig. 399. PHACELIA MAGELLANICA Cov. var. CALIFORNICA Jepson & Bailey. *a,* basal leaf, × ½; *b,* panicle, × ½; *c,* corolla spread open, × 2; *d,* cross-sect. of ovary, × 10.

Var. **californica** Jepson & Bailey comb. n. ROCK PHACELIA. (Fig. 399.) Stems stout, simple, erect, leafy and also leafy-tufted at base, 1 to 2 feet high, usually several from the root-crown; stems and petioles spreading-hispid, sometimes very sparsely so; leaf-blades 2 to 5 inches long, appressed-hispid, either green or grayish, pinnate or pinnatifid, the large terminal lobe elliptic to lanceolate, with 1 to several pairs of smaller or of much reduced leaflets or lobes below, or entire; petioles commonly long; racemes dense, 1 to 2 inches long, mostly rather short-peduncled, the peduncles subterminal in a close panicle or compact cyme; calyx-lobes oblong; corolla purple or pale lavender, bowl-shaped, 2 to 3 lines long; scales oblong, wholly adnate to corolla, the free edges of the adjacent pairs connivent, at base deflected in the opposite direction and attached to base of filament, the true pair thus forming a little pocket behind filament; filaments loosely hairy at middle, exserted (almost twice as long as corolla); style cleft ⅔.—Rocky points or ledges near the coast, 20 to 1500 feet: Humboldt Co. to San Mateo Co. The stamen filaments bear a few long hairs at the middle; the style, cleft to near the middle, is slightly pubescent below the cleft.

Locs.—Cape Mendocino, *Tracy* 4983 (corolla white); Mt. Tamalpais, *Jepson* 21,046; Potrero Hills, w. Contra Costa Co., *Jepson* 21,043; Berkeley Hills, *Jepson* 4048; Mt. Davidson, San Francisco, *Jepson* 10,332; Crystal Springs Lake, San Mateo Co., *C. F. Baker* 690.

Var. **griseophylla** (Brand) Jepson comb. n. Stems 1 or few, slender, erect or ascending, ½ to 1½ feet high, spreading bristly-hirsute; leaves in a basal tuft, the cauline much scattered; leaf-blades oblong and acute to elliptic and sometimes obtuse, entire or often with a pair of small supplementary leaflets at base, strigose, 1 to 2½ inches long; petioles bristly-hirsute; racemes mostly few, open-paniculate or compactly paniculate, or subracemose; calyx-lobes linear or narrow; corolla white or often blue.—Sandy flats or dry opens amongst brush or on brushy or openly wooded slopes, 3500 to 7000 feet: North Coast Ranges from Del Norte Co. to western Siskiyou Co.; Sierra Nevada from eastern Siskiyou Co. to Tulare Co.; cismontane Southern California (rare and somewhat doubtful). June-July.

Locs.—North Coast Ranges: Myrtle Creek below Gasquet, Del Norte Co., *Tracy* 13,529; North Fork Coffee Creek, n. Trinity Co., *Alexander & Kellogg* 230; Corral Prairie, Trinity Summit, *Tracy* 10,432; South Fork Mt., e. Humboldt Co., *Tracy* 8937. Sierra Nevada: Fowlers Camp, McCloud River, se. Siskiyou Co., *Jepson* 20,083; Forestdale, sw. Modoc Co., *M. S. Baker;* Bear Mt., Warner Mts., Modoc Co., *L. S. Smith* 1044; Hot Springs Valley near Lassen Peak, *Jepson* 4107; Warner Creek, Plumas Co., *Jepson* 12,303; Mineral, Tehama Co., *Jos. Grinnell;* Quincy, *Jepson* 19,357; Pioneer road sta., North Fork Yuba River, Sierra Co., *Jepson* 16,800; Bear Valley, Nevada Co., *Jepson* 21,068; upper Truckee River, Eldorado Co., *H. M. Wheeler;* Dorrington, Calaveras Co., *Jepson* 10,054; Cow Creek, Tuolumne Co., *Jepson* 6517; Little Yosemite, *Jepson* 3149; Devils Postpile, Madera Co., *A. L. Grant* 1555; Huckleberry Creek, Huntington Lake, *Jepson* 13,071; Markwood Mdw., Fresno Co., *Jepson* 16,043; betw. Horse Corral Mdw. and Summit Mdw., south side of South Fork Kings River, *Jepson* 764; betw. Marble Fork and Round Mdw. (Giant Forest), *Jepson* 693. Cismontane S. Cal.: Saunders Mdw., San Jacinto Mts., *C. V. Meyer* 592.

Var. **corymbosa** Jepson comb. n. Stems very slender, 11 to 14 inches long, ascending from a dense basal or sub-basal tuft of leaves, glandular-villous; leaf-blades oblong, acute at base and apex, entire, hirsute, ¾ to 1½ inches long, petioled; racemes subumbellately or corymbosely disposed at the summit of the nearly naked stems, the flowers moderately dense; calyx-lobes bristly; corolla white.—Upper Sacramento River in Siskiyou Co.

Var. **jacintensis** (Dundas) Jepson & Hoover comb. n. Stems 1 to 3, slender, erect, almost leafless or with a few reduced leaves, densely puberulent, (½ or) 1 to 2 feet high, arising from the dense basal tuft of leaves on the heavy root-crown; leaf-blades narrowly oblong, acute, entire or the larger pinnatifid below, hirsute and white-pubescent, 1 to 3 inches long, the petioles ½ to as long; racemes spike-like, dense, ½ to 1 inch long, borne on short slender peduncles ¼ to 1 inch long, the peduncles scattered along the axis so that the entire inflorescence is somewhat racemose; corolla light blue.—Montane slopes or benches, 3000 to 8000 feet: San Gabriel Mts. (head of South Fork Lytle Creek, *Johnston* 1451); San Bernardino Mts. (Holcomb Valley, *Parish* 10,885); San Jacinto Mts. (Fern Valley, *Munz* 6060).

Var. **patula** (Brand) Jepson comb. n. Stems few or several from the root-crown, prostrate or ascending, nearly naked, 5 to 13 inches high, the leaves mostly in a basal tuft; leaf-blades ¾ to 2 inches long, ovate to oblong-lanceolate, entire or with 1 to 3 pairs of supplementary lobes below, or deeply pinnatifid; racemes rather short, borne in a mostly compact or subcapitate panicle, sometimes in an open panicle; calyx-lobes narrowly obovate to lanceolate or linear-lanceolate; corolla white.—Montane slopes or dry flats, in open forest, 5000 to 9200 feet: Sierra Nevada in Kern Co.; Mt. Piños region, northern Ventura Co.; San Gabriel, San Jacinto and Cuyamaca mountains. June-July.

Locs.—Kern Co.: South Fork Middle Tule River, *Jepson* 4873; Piute Peak, *Purpus* 5548. Cismontane S. Cal.: Seymour Creek, Mt. Piños, n. Ventura Co., *Munz* 7053a; Mt. Wilson, San Gabriel Mts., *Peirson* 165; Mt. Waterman ridge, San Gabriel Mts., *Peirson* 2451; Bear Valley, San Bernardino Mts., *Munz* 13,254; Tahquitz Valley, San Jacinto Mts., *Jepson* 2309; Stonewall Mine, Cuyamaca Mts., *Parish* 4423.

The differences between var. patula and var. frigida are extremely slight, some might even say trivial. Certainly many collections are as easily referable to one variety as the other and definite placement is made, if at all, on geographic grounds.

Var. **frigida** (Greene) Jepson comb. n. Plants usually compact and low, the leaves mostly basal, the stems ascending or diffuse, nearly naked, hirsute, 3 to 10 inches high; leaf-blades lanceolate to narrowly oblong and acute at both base and apex (rarely ovate), almost always entire, appressed grayish-hirsute, rarely sub-silky, 1 to 2 inches long, tapering into a petiole ¼ to as long; cauline leaves few or almost none, similar, short-petioled or the upper subsessile; racemes rather short, usually in a rather compact panicle; panicle somewhat corymbose or a little racemose, sometimes condensed and capitate; corolla white or pale lavender; scales narrow-oblong, wholly adnate to corolla, the members of contiguous pairs connivent by their free edges, at base adnate to the filaments.—Dry hillslopes or amongst rocks, mostly high altitudes, 5300 to 13,000 feet: North Coast Ranges from Lake Co. to western Siskiyou Co.; Sierra Nevada from Tulare Co. to eastern Siskiyou Co.; White Mts. East to Nevada. June-Sept.

Locs.—The biologically typical form of var. frigida appears to be the extreme high alpine form (9000 to 13,000 feet in the Sierra Nevada) only 3 or 4 inches high with the leaves entire and the inflorescence compacted and capitate or subcapitate (P. heterophylla var. pygmaea Jepson and var. dasyphylla Jepson): Mt. Shasta, *Jepson* 20,992 (9000 feet); Lassen Peak, *H. M. Evans;* Pyramid Peak, Eldorado Co., *Abrams* 12,923 (10,000 feet); Silver Pass, Fresno Co., *A. L. Grant* 1532 (11,400 feet); Mt. Whitney, *Jepson* 1089 (12,000 feet). This extreme alpine state passes by many intergradations into somewhat less condensed forms, cited as follows. North Coast Ranges: near Yreka, *Butler* 1280; Marble Mt., w. Siskiyou Co., *Chandler* 1655; Mary Blaine Mt., Trinity Co., *Tracy* 14,455; South Yollo Bolly, *Jepson* 21,042; Snow Mt., n. Lake Co. Sierra Nevada: Mt. Shasta, *Jepson* 21,040; Eagle Peak, Warner Mts., Modoc Co., *Jepson* 7980; Summit sta., Nevada Co., *Jepson* 21,062; Mt. Tallac, Lake Tahoe, *Jepson* 8143; Carson Pass, *Jepson* 8123; Sonora Pass, *A. L. Grant* 308; Rogers Creek, se. Tuolumne Co., *Jepson* 3383; Bloody Cañon, w. Mono Co., *Jepson* 4457; Kaiser Peak, Fresno Co., *Jepson* 13,024; Chagoopah plateau, Kern Cañon, *Jepson* 5007. White Mts.: Campito Mt., *Jepson* 7289.

Refs.—PHACELIA MAGELLANICA Cov., Contrib. U. S. Nat. Herb. 4:159 (1893). *Hydrophyllum magellanicum* Lam., Jour. Hist. Nat. 1:373, t. 19 (1787), type loc. Straits of Magellan, Patagonia, *Commelin. P. circinata* Jacq. f., Eclog. 1:135, t. 91 (1816), based on *Hydrophyllum magellanicum* Lam. Var. CALYCOSA Jepson & Bailey. *P. circinata* var. *calycosa* Gray, Proc. Am. Acad. 10:317 (1875), without indication of locality or country or collector; Bot. Cal. 1:507 (1876), "Borax Lake [Lake Co.], *Torrey,*" the first definitely cited locality, wherefore *Torrey* 343 (Gray Herb.) is here named lectotype. *P. californica* var. *calycosa* Dundas, Bull. S. Cal. Acad. 33:158 (1935). *P. imbricata* Greene, Erythea 1:127 (1893), type loc. Napa and Sonoma Cos. *P. californica* var. *imbricata* Jepson, Fl. W. Mid. Cal. 439 (1901), ed. 2, 342 (1911), Man. 820 (1925). *P. virgata* var. *bernardina* Greene, Erythea 4:55 (1896), type loc. San Bernardino, *Parish. P. magellanica* f. *bernardina* Brand, Univ. Cal. Publ. Bot. 4:218 (1912). *P. californica* f. *bernardina* Mcbr., Contrib. Gray Herb. 49:36 (1917). *P. californica* var. *bernardina* Jepson, Man. 820 (1925). *P. imbricata* var. *condensata* Brand, Univ. Cal. Publ. Bot. 4:220 (1912), type loc. New York Falls, Amador Co., *Hansen* 1283 in part. *P. imbricata* subvar. *hansenii* Brand, l.c., type loc. Irishtown, Amador Co., *Hansen* 1283 in part. *P. imbricata* var. *caudata* Brand, l.c., type loc. Natoma ditch, Eldorado Co., *K. Brandegee.* *P. magellanica* f. *ferruginea* Brand; Engler, Pflzr. 4^{251}:100 (1913), type loc. Red Mt., n. Mendocino Co., *Eastwood.* Var. HETEROPHYLLA Jepson. *P. heterophylla* Pursh, Fl. 1:140 (1814), type loc. "on dry hills on the banks of the Kooskoosky," Ida., *Lewis;* Jepson, Man. 819 (1925). *P. magellanica* f. *heterophylla* Braud, Univ. Cal. Publ. Bot. 4:218 (1912). *P. virgata* Greene, Erythea 4:54 (1896), type from "n. Cal. and adjacent Ore.," that is, Yreka, *Greene* 832. *P. virgata* var. *ampliata* Greene, Pitt. 4:55 (1896), type loc. Washoe Mts., Nev., perhaps belongs here. *P. magellanica* f. *virgata* Brand, Univ. Cal. Publ. Bot. 4:219 (1912). *P. californica* var. *virgata* Jepson, Man. 820 (1925). *P. californica* f. *vinctens* Mcbr., Contrib. Gray Herb. 49:37 (1917), type loc. Donner Lake, *Heller* 6883. *P. californica* var. *rubacea* Jepson, Man. 820 (1925), type loc. Mt. Konocti, Lake Co., *Jepson* 21,063 (typ. in Herbario Jepsoniano). Var. CALIFORNICA Jepson & Bailey. *P. californica* Cham., Linnaea 4:494 (1829), type loc. San Francisco, *Chamisso;* Jepson, Fl. W. Mid. Cal. 438 (1901), ed. 2, 342 (1911), Man. 820, fig. 787 (1925). *P. magellanica* f. *californica* Brand, Univ. Cal. Publ. Bot. 4:218 (1912). *P. magellanica* f. *jepsonii* Brand; Engler, Pflzr. 4^{251}:100 (1913), type loc. Mt. Tamalpais, *Jepson* 21,045. Var. GRISEOPHYLLA Jepson. *P. magellanica* f. *griseophylla* Brand, Univ. Cal. Publ. Bot. 4:218 (1912), type loc. Sisson, Siskiyou Co., *K. Brandegee* (typ. vidi). *P. heterophylla* var. *griseophylla* Mcbr., Contrib. Gray Herb. 49:35 (1917); Jepson, Man. 819 (1925). *P. heterophylla* Jepson, l.c.; not Pursh. *P. mutabilis* Greene, Erythea 4:55 (1896), type loc. Castle Peak (first named locality), Nevada Co., *Greene.* *P. nemoralis* var. *mutabilis* Mcbr., l.c. 49:37 (1917). *P. stimulans* Eastw., Proc. Cal. Acad. ser. 3, 2:291 (1902), type loc. Kings Cañon, *Eastwood.* *P. magellanica* f. *egena* Brand, Univ. Cal. Publ. Bot. 4:218 (1912), type loc. Kaweah River, *C. F. Baker* 4415. *P. californica* f. *cgena* Mcbr., Contrib. Gray Herb. 49:37 (1917). *P. californica* var. *egena* Dundas, Bull. S. Cal. Acad. 33:161 (1935). *P. nemoralis* var. *pseudohispida* Brand, Univ. Cal. Publ. Bot. 4:219 (1912), type loc. Stalker's, ne. Shasta Co., *M. S. Baker* 344, seems to be merely a form of var. griseophylla, probably produced by shaded habitat. *P. pinnata* var. *pseudohispida* Dundas, l.c. Var. CORYMBOSA Jepson. *P. corymbosa* Jepson, Man. 820 (1925), type loc. Dunsmuir, upper Sacramento River, *Jepson* 6161 (typ. in Herbario Jepsoniano). Var. JACINTENSIS Jepson & Hoover. *P. californica* var. *jacintensis* Dundas, Bull. S. Cal. Acad. 33:160 (1935), type loc. Tahquitz Valley, San Jacinto Mts., *Jaeger* 1045. Var. PATULA Jepson. *P. magcllanica* f. *patula* Brand, Univ. Cal. Publ. Bot. 4:219 (1912), type loc. Stonewall Mine, Cuyamaca Mts., *Parish* 4423. *P. californica* var. *patula* Jepson, Man. 820 (1925). Var. FRIGIDA Jepson. *P. frigida* Greene, Pitt. 4:39 (1899), type loc. Mt. Shasta, *C. H. Merriam.* *P. alpina* Rydb., Mem. N. Y. Bot. Gard. 1:324 (1900), type loc. Cedar Mt., Mont., *Rydberg & Bessey* 4855. *P. magellanica* f. *alpina* Brand, Univ. Cal. Publ. Bot. 4:217 (1912). *P. magellanica* f. *frigida* Brand, l.c. 218. *P. heterophylla* f. *frigida* Mcbr., Contrib. Gray Herb. 49:35 (1917). *P. heterophylla* var. *frigida* Jepsou, Man. 819 (1925). *P. leucophylla* var. *alpina* Mcbr. l.c. 34, as to Cal. plant cited. *P. compacta* Greene; Baker, West Am. Pl. 1:18 (1902), type *C. F. Baker* 1142 [Spooner, Douglas Co., Nev.]; nomen nudum. *P. magcllanica* f. *compacta* Brand, Univ. Cal. Publ. Bot. 4:217 (1912). *P. leucophylla* var. *compacta* Mcbr., Contrib. Gray Herb. 49:34 (1917). *P. hetcrophylla* var. *dasyphylla* Jepson, Man. 819 (1925), type loc. Silver Pass, Fresno Co., *A. L. Grant* 1532 (first adequate publication), the name based on *P. dasyphylla* Greene (Brand in Engler, Pflzr. 4^{251}:97,—1913, nomen subnudum); the filaments vary from slightly hairy to glabrous in high alpine material from the Mt. Whitney region; since there are no other differences between this form and var. frigida, such a slight variation is negligible. *P. heterophylla* var. *pygmaea* Jepson, Man. 819 (1925), type loc. Mt. Shasta, *Jepson* 20,992 (typ. in Herbario Jepsoniano).

3. **P. nemoralis** Greene. Stems 1 or few from the base, simple below, paniculately branched above, 1¼ to 3 feet high, very bristly with long stinging hairs; herbage light green; leaf-blades elliptical to oblong, 1 to 4 inches long, simple and entire or with a pair of small leaflets at base; basal and lower leaves on petioles 2 to 3 inches long, uppermost short-petioled or sessile; racemes 1½ to 2½ inches long, slender, in 2s or 3s, terminating the stems or lateral branches; corolla whitish, 2 lines long; capsule 2-seeded.

Moist shady flats or hillslopes, 20 to 1800 feet: Coast Ranges from the Santa Cruz Mts. to Mt. Diablo and Sonoma Co. June.

Tax. note.—Phacelia nemoralis differs only slightly from various forms of Phacelia magellanica and on the basis of morphological characters were perhaps better disposed as a varietal form of that complex or reduced to var. griseophylla of P. magellanica. The narrower-leaved states of Phacelia nemoralis (Mt. Tamalpais, *Eastwood;* Oakland Hills, *Lcmmon;* Loma Prieta, *W. W. Price*) simulate closely Phacelia magellanica var. griseophylla. It must be noted, too, that of the varieties of Phacelia magellanica, var. frigida, for example, differs more from var. calycosa (the most abundant and geographically central phase in California) than does Phacelia nemoralis from the var. calycosa. This circumstance is, to be sure, often a feature of complex species, a great diversity within the group accompanied by a wide mass of intergradation. Phacelia nemoralis is, however, biennial as opposed to the perennial duration of all Phacelia magellanica forms and if it be narrowly restricted to the phase represented by Greene's original specimens, then it takes on distributional significance in a limited area of the region of San Francisco Bay and is quite segregated geographically from Phacelia magellanica var. griseophylla.

Locs.—Eva sta. (Forest Grove), Santa Cruz Mts., *Jepson* 21,036; Crystal Springs Lake, San Mateo Co., *Elmer* 4419; San Francisco, *K. Brandegee;* Redwood Peak, Oakland Hills, *T. Brandegee;* Berkeley Hills, *Jepson* 21,037; Mt. Diablo, *Bowerman* 2233; Mt. Tamalpais, *T. Brandegee;* Petaluma, *Tidestrom;* Sonoma.

Refs.—PHACELIA NEMORALIS Greene, Pitt. 1:141 (1887), type loc. Oakland and Berkeley hills, *Greene;* Jepson, Fl. W. Mid. Cal. 439 (1901), ed. 2, 342 (1911), Man. 821 (1925). *P. biolettii* Greene, Pitt. 5:23 (1902), type loc. Redwood Cañon, Mt. Tamalpais, *Bioletti;* (the "Sequoia Cañon" of Michener & Bioletti is Redwood Cañon of Muir Woods, Mt. Tamalpais, not "Oakland Hills").

4. **P. dalesiana** J. T. Howell. Plants 2 to 4 inches high, the decumbent stems and basal leaves arising from the stout root-crown; stems 1 or 2-leaved, the leaves opposite or nearly opposite when 2, borne at the summit of the stem (that is, at the base of the terminal raceme); petioles and stems villous-puberulent, the leaf-blades minutely strigulose; basal leaf-blades broadly ovate to elliptic or oblong, entire, acute or subobtuse, ¾ to 1¾ inches long, the petioles ½ to 1½ times as long; blades of cauline leaves ½ to 1 inch long; racemes few (3 to 5)-flowered, very loose, the pedicels straight or curved, 2 to 8 lines long; calyx-lobes about as long as the corolla-tube; corolla dull white, open-campanulate, 3 to 3½ lines long, its limb rotate, 5 to 7 lines wide; corolla-lobes about as long as the tube; scales shortly fan-shaped, wholly adnate to corolla, free from the filaments; anthers dark purple; style cleft ⅚ to base, the branches pilose to about the middle; ovules 2 to each placenta, attached at upper end; capsule mostly 2-seeded, shorter than the calyx; seeds oval.

Mountain meadows, 5500 to 6000 feet: Scott Mts., northeastern Trinity Co. May-June.

Geog. note.—Phacelia dalesiana, a remarkable narrow endemic, is confined (so far as now known) to the summit of the Scott Mountains north of Carrville. The racemes, as in Phacelia eisenii and P. pringlei and often in P. curvipes, are not scorpioid or only slightly so. The nearly naked stems are peduncle-like, although the few leaves they bear are as large or larger than some of the basal leaves. The habit and leaves are somewhat suggestive of Hesperochiron pumilus or californicus, a point emphasized by the describer of this unusual species. In Hesperochiron, however, the peduncles are quite naked and the plant acaulescent.

Ref.—PHACELIA DALESIANA J. T. Howell, Lflts. West. Bot. 2:51 (1937), type loc. summit of Scott Mts., n. of Carrville, Trinity Co., *Eastwood & Howell* 5014 (cotyp. vidi).

5. **P. perityloides** Cov. Stems several from a branched woody root-crown, freely branched, decumbent or semi-prostrate, forming a dense somewhat mat-like or low mound-like plant 3 to 5 inches high and 6 to 14 inches broad; main stems white-lanate; branchlets and foliage densely glandular-pubescent; herbage heavily ill-scented; leaf-blades orbicular, cordate or truncate at base, sharply dentate, 2 to 6 lines long; petioles ¼ to 2 inches long, mostly longer than the blades; racemes short, loose, rather few-flowered; pedicels curved-spreading, 3 to 3½ lines long; calyx-lobes obovate to oblong-spatulate, in fruit slightly exceeding the ovate capsule; corolla white, subcylindric (that is, enlarged a little upward), 4 lines long, twice as long as the calyx, the throat yellowish or purplish; scales narrowly linear or almost lineate, quite free from the filaments; stamens included; ovules 160 to 200 to each placenta.

Crevices of rocks or recesses or open caverns of cliffs in desert cañons or sometimes in washes of cañon bottoms, 2700 to 5200 feet: Grapevine Mts. and Panamint Range bounding Death Valley, southeastern Inyo Co. May-June.

Note on range.—Phacelia perityloides is a narrow endemic restricted to the ranges bordering Death Valley, the Grapevine Mts. on the east and the Panamint Range on the west. It has been found in Titus Cañon of the Grapevine Mts. (*Peirson* 11,807) and occurs in Surprise and Pleasant cañons on the west slope of the Panamint Range and in Hanaupah Cañon (*Jepson* 7060) and Johnson Cañon (*Jepson* 19,762) on the east slope. Its longitudinal range, so far as now known to us, is about 28 miles.

In Hanaupah Cañon, near the "big spring," a plant of this species was found in a crevice of a cliff; its stems hung down so as to make a leafy drapery which covered six feet of the rocky wall. The main unbranched stems were often 4 feet long. In material from this station teratological flowers were found in which chorisis of the normally regular corolla was accompanied by a bilabiate arrangement of the resulting petals. This station is at 4500 feet. The odor of the herbage is rather mephitic and very disagreeable. The stems are very fragile.

This species has been considered identical with Phacelia glechomaefolia Gray of Arizona (Jones, Proc. Cal. Acad. ser. 2, 5:708). Phacelia glechomaefolia is, however, an erect loosely-branched plant so different in form and leafage from P. perityloides with its low mound-like habit, that the two, aside from the loose many-flowered racemes of the Arizona plant, contrasting with the close few-flowered racemes of the Death Valley plant, may be regarded as quite unlike.

Refs.—PHACELIA PERITYLOIDES Cov., Proc. Biol. Soc. Wash. 7:75 (1892), type loc. Johnson Cañon, Panamint Mts., *Coville* 524; Contrib. U. S. Nat. Herb. 4:160, t. 15 (1893); Jepson, Man. 825 (1925).

6. **P. hydrophylloides** Torr. (Fig. 400.) Stems few to many, spreading or decumbent, usually branched, sometimes simple, finely hispid with spreading hairs, 4 to 10 inches high, arising subterraneously from the deep-seated crown of a thick woody taproot; leaf-blades broadly ovate to oblong-ovate, incisely few-toothed or lobed (especially towards the base), silky-strigose on both sides, ½ to 2½ inches long, sometimes with 1 or 2 pairs of supplementary leaflets near summit of the petiole; petioles 1 line to 1¼ inches long; racemes short, congested in a capitate cyme; calyx-lobes narrow-linear or linear-spatulate; corolla cup-shaped, violet-blue or whitish, 3 lines long, its spreading lobes revolute from each side so that they become pointed, the corolla-limb thus a little star-shaped; scales semi-oval or broadly linear, wholly adnate, the free edge undulate, the pair united below with base of filament; stamens and style conspicuously exserted, the style 2-parted nearly to the middle or below; capsule 3 to 8-seeded, the seeds angled.

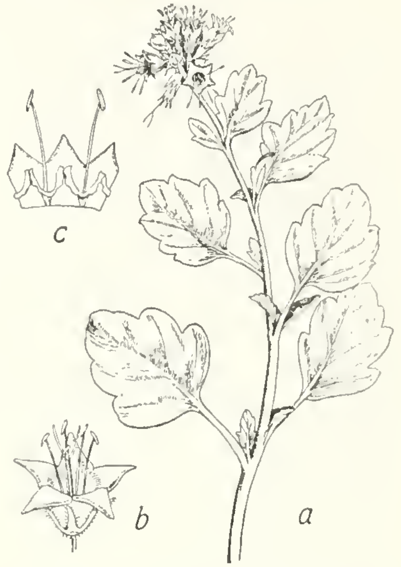

Fig. 400. PHACELIA HYDROPHYLLOIDES Torr. *a*, fl. branch, × ½; *b*, fl., × 2; *c*, sect. of corolla showing scales and 2 stamens, × 2.

Dry sandy or gravelly or granite soil, high montane, 5000 to 9000 feet: Sierra Nevada from Lassen Peak to Tulare Co. East to Nevada. June-Aug.

Biol. note.—In open pine forests of the Sierra Nevada Phacelia hydrophylloides forms circular colonies. The root-crown is very deep-seated; it gives rise to branched and spreading subterranean stems which in the course of time develop taproots and become independent of the central root-crown.

Locs.—Lassen Peak, *Chesnut & Drew;* Summit sta., Nevada Co., *Jepson* 21,028; Silver Lake, Alpine Co., *Jepson* 10,095; Eagle Mdw., Eagle Peak, Tuolumne Co., *Hoover* 3638; Matterhorn Cañon, se. Tuolumne Co., *Jepson* 3370; Eagle Mdw. trail, Yosemite, *A. L. Grant* 374; Badger Flats, Kaiser Ridge, *E. Ferguson* 396; near Cahoon Mdw., w. of Mt. Silliman, Tulare Co., *Jepson* 718.

Refs.—PHACELIA HYDROPHYLLOIDES Torr.; Gray, Proc. Am. Acad. 7:400 (1868), type loc. Ebbetts Pass, *Brewer;* Jepson, Man. 825, fig. 792 (1925).

7. **P. procera** Gray. Stems very stout, erect, simple, usually in clusters from a heavy root-crown, equably leafy to the inflorescence, 3 to 7 feet high; herbage puberulent, the summit of the stem and the inflorescence glandular; leaf-blades ovate to ovate-lanceolate, 2½ to 4½ inches long, laciniate-pinnatifid into a few coarse acute lobes, sometimes deeply incised, or the lower leaf-blades with supplementary leaflets; racemes mostly geminate, the many pairs disposed in a compact terminal panicle; calyx-lobes linear, acute, shorter than the capsule; corolla sordid

white, greenish or bluish, bowl-shaped, 2½ to 3 lines long, with short obtuse revolute lobes; scales oblong or semiovate, acute at tip, adnate, divergent, at base united over the base of the filament and adnate to it; stamens well-exserted; ovary with gland-tipped hairs; style deeply 2-cleft; capsules ovate, beaked; seeds 12 to 16, strongly 3-carinate or wing-angled.

Mountain meadows or in valleys along streams, 4000 to 7000 feet: Sierra Nevada from Placer Co. to eastern Siskiyou Co.; North Coast Ranges from Humboldt Co. to western Siskiyou Co. North to Idaho and Washington. July-Aug.

Locs.—Sierra Nevada: Emigrant Gap, Placer Co. (Engler, Pflzr. 4^{251}:110); Lincoln Valley, s. Sierra Co., *Kennedy & Doten* 207; Butte Creek, Jonesville, Butte Co., *H. F. Copeland;* Gold Lake near Mt. Elwell, Plumas Co., *Ewan* 8189; Susanville, *T. Brandegee;* Lassen Peak, *R. M. Austin;* McCloud River near Bartle's, e. Siskiyou Co., *M. S. Baker.* North Coast Ranges: South Fork Mt., Humboldt Co., *Chesnut & Drew;* Corral Prairie, Trinity Summit, *Tracy* 10,431; White's Lake, North Fork White's Creek, Devils Cañon Mts., Trinity Co., *Tracy* 14,675; Salmon Summit, sw. Siskiyou Co., *Jepson* 2076; Shackleford Creek, w. Siskiyou Co., *Butler* 1679; Poker Flat, w. Siskiyou Mts., *Jepson* 18,562.

Refs.—PHACELIA PROCERA Gray, Proc. Am. Acad. 10:323 (1875), "Sierra and Nevada Cos.," *Bolander, Lemmon;* Jepson, Man. 826 (1925).

8. **P. bolanderi** Gray. Stems stout, simple or sparingly branched, hirsute throughout, glandular-hirsute above, ½ to 2 feet high; leaf-blades broadly ovate to oblong, coarsely serrate or incised, hirsute, 2 to 3¾ inches long, the lower commonly with 1 or 2 pairs of small leaflets towards summit of petiole; racemes in a terminal corymb or panicle; calyx-lobes oblong, glandular-hirsute; corolla nearly rotate, violet, very pale blue or white, ½ to 1 inch wide; scales narrow, wholly adnate; stamens somewhat exserted or included, sparingly pilose; style cleft to middle or below.

Rocky soil of river benches or river bars, or on coastal bluffs, 10 to 200 feet: along or near the north coast from Sonoma Co. to Del Norte Co. North to Oregon. June-July.

Locs.—Gualala, Sonoma Co., *Michener & Bioletti;* Navarro River (7 mi. above mouth), s. Mendocino coast, *Follett* 87; betw. Kenny sta. and Usal, n. Mendocino coast, *Jepson* 2153; betw. Hubbards sta. and Camp Grant, lower Eel River, *Jepson* 1910; betw. Bluff Creek and Orleans, Klamath River, *Chandler* 1456; South Fork Smith River, Del Norte Co., *Jepson* 2888. Ore.: Tamba ranch, Chetco River, *Jepson* 9367. The herbage has a disagreeable odor; it stains paper brownish in drying.

Refs.—PHACELIA BOLANDERI Gray, Proc. Am. Acad. 10:322 (1875), type loc. "Cottonaby Creek, 20 mi. n. of Noyo," that is near Rockport, Mendocino coast, *Bolander* 6575; Jepson, Fl. W. Mid. Cal. ed. 2, 341 (1911), Man. 826 (1925)

9. **P. sericea** Gray. Stem erect from a heavy root-crown, leafy to the top, 4 to 18 inches high, finely puberulent; leaf-blades ovate to oblong in outline, puberulent to canescent above, canescent below, ¾ to 3 inches long, pinnatifid into linear or oblong ascending lobes, the lobes few-cleft or toothed or entire; racemes short, crowded in spike-like panicle, the panicle 1 to 6 inches long; corolla white or blue, open-campanulate, cleft to middle, withering-persistent, 3 lines long; scales oblong, free from the filaments; stamens and style conspicuously exserted (over twice as long as corolla); style cleft at apex; capsule slightly exceeding the calyx; seeds 8 to 18, foveolate-reticulate.

Cliffs and rocky slopes in the mountains, 8600 to 11,000 feet: Modoc Co. East to Arizona and Colorado, north to British America. June-July.

Geog. note.—Throughout the Rocky Mountains from Colorado north into British America, Phacelia sericea has a wide distribution. It also occurs in the ranges of the Great Basin and bordering territory from northern Arizona (near Flagstaff, *Purpus*) and from Nevada and Utah north into Oregon, Washington and Idaho. Many Great Basin plants reach the eastern margins of California and this species occurs in the Warner Mountains in eastern Modoc County, specifically on the Eagle Peak Ridge (*L. S. Smith* 1038). This station is, thus, an outlying one, and the only one now known within our area.

Refs.—PHACELIA SERICEA Gray, Am. Jour. Sci. ser. 2, 34:254 (1862). *Eutoca sericea* Graham; Hook., Bot. Mag. t. 3003 (1830), type loc. n. Rocky Mts., *Drummond.*

10. **P. breweri** Gray. (Fig. 401.) Stem simple and erect or diffusely branching from the base, 4 to 9 inches high, the branches slender and with rather long internodes; herbage pallid, the stems hirsute and microscopically puberulent, the leaves strigose; leaf-blades oblong-lanceolate, entire or cleft towards the base, or the lowermost and basal pinnately divided, ½ to 1½ inches long, on petioles 1 to 5 lines long; racemes slender, lax or sometimes dense, 1 to 3 inches long, often geminate at the ends of the branches; calyx-lobes linear, bristly-hirsute; corolla blue or whitish, 2 to 2½ lines long, its scales narrow, acute at apex, wholly adnate; stamens glabrous, included; style cleft ⅔; capsule ovate, short-acuminate, mostly 1-seeded.

Dry slopes, often on land slides, 600 to 4000 feet: inner South Coast Range from eastern Contra Costa Co. to San Benito Co. Apr.-July.

Locs.—Mt. Diablo, *Jepson* 9656; Hospital Cañon, w. Stanislaus Co., *Hoover* 3074; Mt. Day, *R. J. Smith;* Mt. Hamilton, *Jepson* 4207; Panoche Pass, e. San Benito Co., *Keck & Stockwell* 3357; New Idria, San Benito Co., *Eastwood.*

Refs.—PHACELIA BREWERI Gray, Proc. Am. Acad. 10:317 (1875), type loc. Mt. Diablo, *Brewer* 1058; Jepson, Fl. W. Mid. Cal. 439 (1901), ed. 2, 342 (1911), Man. 821, fig. 788 (1925).

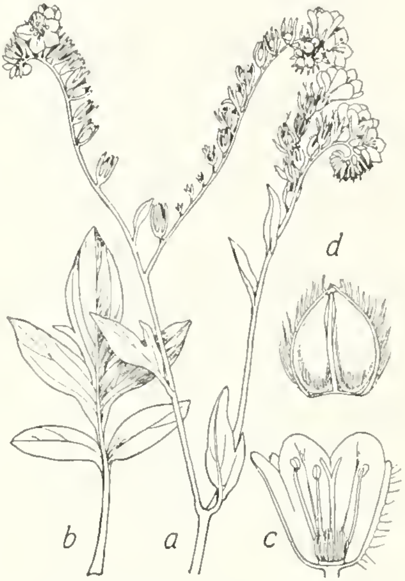

Fig. 401. PHACELIA BREWERI Gray. *a*, fl. branchlet, × 1; *b*, leaf, × 1; *c*, long. sect. of fl., × 3; *d*, long. sect. of ovary, × 6.

11. **P. lobata** (Dav.) Jepson comb. n. Stems erectly branched from the base, 1½ to 4 inches high, or sometimes diffusely branched with branches 10 inches long; herbage hirsute with spreading or ascending more or less glandular hairs; leaf-blades lanceolate, 4 to 7 lines long (or to 1½ inches long), entire or the lower ones incised or few-toothed towards the base; racemes slender, terminal and also on axillary peduncles from near the base, ½ to 1 inch long; pedicels ¼ to 2½ lines long, in fruit a little curved or even retrocurved; calyx-lobes linear-oblanceolate, hirsute, unequal; corolla white, campanulate, 1¼ lines long, slightly exceeding the calyx-lobes; scales linear-oblong, diverging from base of filament and approximating scale of contiguous pair, these two scales then becoming vertical and connivent, truncatish at apex; stamens included, glabrous; style cleft ½ to ⅔, slightly hairy at base; ovules 2 to each placenta; capsule 4-seeded, the seeds pitted-foveolate.

Dry montane slopes, 4000 to 7000 feet: San Gabriel Mts., mostly north slope; Sierra Nevada in Kern Co. May-June.

Locs.—San Gabriel Mts.: near Rock Creek divide, *Peirson* 2486; Icehouse Cañon, San Antonio Mts., *Peirson* 506; Lytle Creek Cañon, *Hall* 1459. Kern Co.: Erskine Creek, *Purpus* 5292.

Refs.—PHACELIA LOBATA Jepson. *P. humilis* var. *lobata* Dav., Bull. S. Cal. Acad. 5:61 (1907), type loc. Lowell Mine, head of Rock Creek, San Gabriel Mts., *Hasse & Davidson* 1941.

12. **P. eisenii** T. Bdg. Stems slender, branched from base (or sometimes simple), erect or diffuse, 1½ to 7 inches high; herbage short-hirsute and somewhat glandular; leaf-blades lanceolate to oblong to elliptic, entire or serrate or incisely few-lobed, 4 to 8 lines long, narrowed to a petiole half to as long; racemes loose, not scorpioid, the flowers on slender spreading pedicels ½ to 1½ lines long; calyx-lobes narrowly spatulate, moderately unequal, 1 to 1½ lines long; corolla blue or dull white, hairy at base inside, ¾ to 1½ lines long, the scales short, wholly adnate

and united at base in front of the filament; style deeply 2-cleft; capsule globose, shorter than the calyx, 4-seeded; seeds punctate-reticulate.

Moist sandy spots on granite domes or on rocky slopes in open forest, 4100 to 8500 feet: Sierra Nevada from Eldorado Co. to Tulare Co. May-Aug.

Field note.—The stems or branches of Phacelia eisenii, a somewhat delicate plant, are usually a little flexuous. The racemes are very loose and ¾ to 2½ inches long. The initial raceme or a pair of racemes is borne at the very base of the plant, the successive racemes remotely scattered in the axils up the branches to the terminal raceme. The pedicels are often abruptly retrocurved at the very apex.

Locs.—Fallen Leaf Lake, Eldorado Co., *Ottley* 1181; betw. Mill Creek and Niagara Creek, Tuolumne Co., *Hoover* 3636; Conness Creek, Tuolumne Co., *Jepson* 4486; McKinley Grove, Fresno Co., *Hall & Chandler* 362; Mt. Moses, Tulare Co., *Purpus* 1680; Middle Tule River, s. Tulare Co., *Purpus* 1791.

Refs.—PHACELIA EISENII T. Bdg., Zoe 2:252 (1891), type loc. Fresno Co., *Eisen;* Jepson, Man. 821 (1925). *P. minima* Mcbr., Contrib. Gray Herb. 49:38 (1917), type loc. Lake Tenaya, Mariposa Co., *Congdon.*

13. **P. humilis** T. & G. Stems 1 or few from the base, naked below, leafy above, often reddish, 2½ to 5 (or 8) inches high; herbage hirsute; leaf-blades lanceolate to linear-oblong (or sometimes ovate), acute, entire, ½ to 1¾ inches long; petioles short (1 to 5 lines long); racemes short, borne terminally on the spreading branches; calyx-lobes linear to narrowly spatulate, bristly-hirsute, ½ to ¾ as long as corolla; corolla open-campanulate, blue to purple with a white center, 1½ to 2½ lines long; scales oblong, wholly adnate to corolla, the free edges united below in pairs at base of filaments; stamens hairy about the middle or subglabrous, slightly exserted; style parted nearly ½, rarely more, sparingly glandular-puberulent; capsule 1 to 4-seeded, the seeds regularly foveolate.

Montane, loose soil in shade of trees or bushes on gravelly or rocky slopes, 5000 to 8600 feet: Sierra Nevada on the east side, from Inyo Co. to Modoc Co. and eastern Shasta Co. East to Nevada, north to Washington. June-Aug.

Locs.—Buttermilk country, w. Inyo Co., *Duran* 3470; Lundy, Mono Co., *Maud Minthorn* 48; Bloody Cañon, w. Mono Co., *Chesnut & Drew;* Deer Park, Placer Co., *C. J. Fox Jr.;* Donner Lake, Nevada Co., *Heller* 6866; Big Mdws., Plumas Co., *R. M. Austin;* Martin Sprs., Eagle Lake, Lassen Co., *Brown & Wieslander* 63; Mill Creek Mdws., Warner Mts., *L. S. Smith* 984.

Refs.—PHACELIA HUMILIS T. & G., Pac. R. Rep. 2:122, pl. 7 (1854), type collected by *Snyder* "near summit of Sierra Nevada" on Lieut. Beckwith's route (that is, near Nobles Pass, se. Shasta Co.). *P. irritans* Brand, Beitr. Hydroph. 7 (1911), type loc. Little Truckee River, *Hall & Babcock* 4523; Jepson, Man. 822 (1925). *P. humilis* var. *calycosa* Gray, Proc. Am. Acad. 10:318 (1875), no locality or specimen cited; Bot. Cal. 1:507 (1876), type loc. Mono Lake, *Bolander.*

14. **P. dociana** Jepson & Hoover sp. n. (Fig. 402.) Stem subsimple or branching from the base, erect, 2 to 9 inches high, hirsute or hirsutulous with spreading glandular hairs; leaves hirsutulous with ascending hairs and somewhat glandular, the blades linear to narrow-ovate, lanceolate or oblanceolate, entire, ½ to 1½ inches long, thickish, strongly veined, attenuate to a short (½ to 2 lines) petiole; racemes somewhat dense, short (½ to 1¾ inches long), borne on short axillary branchlets along the leafy stem from the base to the summit, sometimes not exceeding the subtending leaves, sometimes exceeding them; calyx-lobes linear or a little spatulate-dilated, hispid, ¾ as long as the corolla; corolla campanulate, blue or lavender, 1½ to 2 lines long, its scales oblong, wholly adnate, truncate at apex, joined in pairs at base; stamens exserted, glabrous; style parted ⅔ to nearly to base; seeds 4, foveolate.—(Caulis subsimplex vel a basi ramosus, erectus, 2–9 unc. altus, glanduloso-hirsutus vel -hirsutulosus, pilis patentibus; folia pilis ascendentibus, subglandulosa; laminae lineares vel anguste ovatae, integrae, ½–1½ unc. longae, subcrassae, venatae valde, petiolo brevi (½–1½ lin.) attenuatae; racemi subdensi, breves (½–1¾ unc.), in ramulis brevibus axillaribus usque per totam longitudinem caulis a basi ad apicem dispositi, nunc folio subtenso breviores, nunc longiores; calycis lobi lineares vel paulo spatulato-dilati, ¾ longitudinis corollae; corolla campanulata, coerulea, 1½–2 lin. longa, squamis oblongis, peradnatis, apice truncatis; stamina exserta, glabra; semina 4, foveolata.)

Montane gravelly flats or slopes in granite sand, 4000 to 8300 feet: Sierra Nevada on the west slope from Eldorado Co. to Tulare Co. May-July.

Tax. note.—The specific name is for a former student at Berkeley, Docia Patchett, who worked upon the Phaceliae of California in 1916. She was the first to note distinctions between these plants and the plants of Phacelia humilis of the east slope of the Sierra Nevada.

Locs.—Strawberry sta., Eldorado Co., *Hall* 11,385; Douglas sta., Alpine Co., *Hoover* 3642; Brightman Flat, Tuolumne Co., *Hoover* 1348; Harden Lake, Tuolumne Co., *A. L. Grant* 1287; Hetch-Hetchy, *A. L. Grant* 811; Stubblefield Cañon, se. Tuolumne Co., *Jepson* 4534; betw. Alder Creek and Peregoy Mdw., Yosemite, *Jepson* 4336; El Capitan (summit), *Jepson* 4355; Lake Florence, Fresno Co., *E. Ferguson* 459; Mineral King, Tulare Co., *T. Brandegee.*

Refs.—PHACELIA DOCIANA Jepson & Hoover; type loc. Snow Creek, Yosemite, *Jepson* 4336. *P. humilis* Brand in Engler, Pflzr. 4^{251}:102 (1913), in greater part (not T. & G.); Jepson, Man. 821, fig. 789 (1925).

15. **P. marcescens** Eastw. Stems erect, simple or branching, 4 to 9 inches high; herbage and inflorescence glandular, puberulent; leaf-blades ovate to ovate-lanceolate, commonly entire or some toothed at base or with 1 or 2 pairs of supplementary lobes; racemes rather dense, the flowers subhorizontally spreading; corolla blue, deeply cup-shaped, cleft half-way, 2 lines long, only gradually or slowly pushed off by the enlarging capsule; scales long and very narrow, adnate or sometimes with a short free apex; stamens exserted; style cleft ⅔ or ¾; capsule 1 (sometimes 2 to 4) -seeded.

Montane flats or slopes, 4500 to 6900 feet: Sierra Nevada in Nevada and Placer Cos. June-July.

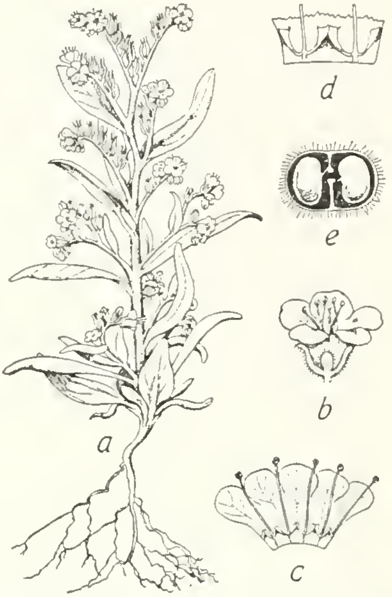

Fig. 402. PHACELIA DOCIANA Jepson & Hoover. *a*, habit, × ½; *b*, fl., × 2½; *c*, corolla spread open, × 2½; *d*, corolla-scales, × 5; *e*, x-sect. of ovary, × 5.

Geog. note.—Phacelia marcescens is an endemic of extremely narrow range. It has thus far been found only on the headwaters of Bear River and of the North Fork American River. Its extreme longitudinal range appears to be about ten miles. Here cited are: Bear Valley, Nevada Co., *Jepson* 21,029; Emigrant Gap, *Jones* 3294; Cisco Butte, *Hall* 8756; Serena Lake, near Donner Peak, Placer Co., *N. French* 463. The original description reads, "stylo solum apice bifido," but material from the type locality has styles cleft ¾ of the way to the base.

Refs.—PHACELIA MARCESCENS Eastw.; Mcbr., Contrib. Gray Herb. 49:39 (1917), type loc. Bear Valley, Nevada Co., *Bolander;* Jepson, Man. 821 (1925).

16. **P. racemosa** Bdg. Stem slender, erect, simple below, commonly with opposite branches above, 4 to 8 inches high, glabrous and glaucous below the inflorescence; leaf-blades narrowly lanceolate, entire, tapering at base, puberulent, ½ to 1½ inches long, shortly petioled or subsessile, equaling or surpassing the racemes; racemes loose, few to several-flowered, the rachises and calyx-lobes glandular-puberulent; calyx-lobes linear-spatulate, unequal, shorter than the corolla, scarcely accrescent; corolla dull white or blue, cylindric-campanulate, 1 to 2 lines long; scales linear or oblong, wholly adnate; stamens included, glabrous; style cleft ¾; ovules 1 or 2 to each placenta; capsule globose, shorter than the calyx.

Stony soil of montane slopes, 5300 to 7500 feet: Sierra Nevada from Lassen and Plumas Cos. to Fresno Co. June-July.

Field note.—Phacelia racemosa, with its opposite leaves, has the habit of slender dwarf Collinsias, the simple stem corymbosely branching at summit. The corolla is pale, translucent between the veins, thus imparting a coralline appearance. At base of corolla-tube inside occur 5 yellow glands or pits.

Locs.—Eagle Lake, Lassen Co., *R. M. Austin;* Hot Springs Valley, Plumas Co. (s. side of Lassen Peak), *Jepson* 4104; Jonesville, Butte Co., *E. B. Copeland* 684; Donner Pass, Nevada Co., *Heller* 6981; Cisco, Placer Co., *K. Brandegee;* Glacier Point, Yosemite, *Hall* 9146; Dinkey Creek, Fresno Co., *Hall & Chandler* 435.

Refs.—PHACELIA RACEMOSA T. Bdg., Zoe 2:252 (1891); Jepson, Man. 822 (1925). *Nama racemosum* Kell., Proc. Cal. Acad. 5:51 (1873), type loc. Cisco, *Kellogg & Brannan*. *P. namatoides* Gray, Proc. Am. Acad. 10:317 (1875), new name for N. racemosum Kell.

17. **P. pringlei** Gray. Stems slender, simple below, widely and oppositely branched above, 3 to 7 inches high; herbage finely glandular-puberulent; leaf-blades oblanceolate or linear, entire, ½ to 1½ inches long, at least the lower opposite, narrowed to petioles 2 to 6 lines long; racemes axillary, few to several-flowered, loose, scarcely scorpioid, paniculately disposed; calyx-lobes linear, exceeding the capsule; corolla pale blue or whitish, 1½ to 2 lines long, the scales semi-lanceolate or very obscure; stamens included, the filaments hairy at middle; style cleft nearly to base; ovules 2 or 3 (or 5) to each placenta.

Sandy moist montane flats or slopes, 4000 to 8000 feet: North Coast Ranges from Trinity Co. to western Siskiyou Co. and Del Norte Co. North to southern Oregon. July-Sept.

Locs.—North Coast Ranges: Mary Blaine Mt., Trinity Co., *Tracy* 14,443; Union Lake, Salmon Mts., *Hall* 8613; near Sisson, *Lemmon;* Twin Valley, Del Norte Co., *Ruby Van Deventer* 298.

Var. **orogenes** (Brand) Jepson. Herbage hirsute, not glandular; corolla lavender, the tube white; stamens slightly exserted.—Mineral King, Tulare Co., s. Sierra Nevada. It is too slightly known for proper evaluation.

Refs.—PHACELIA PRINGLEI Gray, Proc. Am. Acad. 17:223 (1882), type loc. "mts. about the headwaters of the Sacramento River," 7000 feet, *Pringle;* Jepson, Man. 827 (1925). Var. OROGENES Jepson, Man. 827 (1925). *P. orogenes* Brand, Beitr. Hydroph. 7 (1911), type loc. Eagle Lake trail, near Mineral King, Tulare Co., *Hall & Babcock* 5354.

18. **P. floribunda** Greene. Stem stout, divergently branching, reddish, forming a coarse plant 2 to 3 feet high; herbage glandular-hirsute or -bristly with spreading hairs, and also finely puberulent; leaf-blades ovate in outline, 1¼ to 5 inches long, pinnate with the pinnae pinnately cleft or parted, the ultimate lobes irregularly or doubly crenate or pinnatifid; racemes many, densely crowded in a corymbose panicle; calyx-lobes pinnately parted into 3 to 6 divergent spatulate divisions, or 1 or 2 calyx-lobes linear-spatulate and entire, ciliate; corolla lilac or light blue, spreading-campanulate, 2 to 3¼ lines long, its scales semiovate with acute tips, wholly adnate; stamens exserted; style parted below the middle; seeds 2, 3 or 4, deeply favosely reticulate.

Sheltered slopes or flats, 5 to 500 feet: islands off the south coast of California and Lower California. Mar.-May.

Locs.—Santa Barbara Isls.: San Clemente Isl., *Murbarger* 198. L. Cal.: Guadalupe Isl., *Anthony* 242.

Refs.—PHACELIA FLORIBUNDA Greene, Bull. Cal. Acad. 1:200 (1885), type loc. Guadalupe Isl., L. Cal., *Greene*. *P. phyllomanica* Gray var. *interrupta* Gray, Proc. Am. Acad. 11:87 (1876); both the species, P. phyllomanica, and its variety published without indication of country, locality or collector, but in Syn. Fl. 2:161 (1878) Guadalupe Isl., L. Cal., *Palmer*, is cited for both.

19. **P. platyloba** Gray. Stem very slender, erect, sparingly branched, sparsely leafy, 1 to 2½ feet high; herbage minutely glandular-pubescent and spreading-hirsute, especially above and in the inflorescence; leaf-blades ¾ to 3 inches long, pinnate with petiolulate leaflets or at least distinct divisions, the leaflets or divisions discrete or remote, oblong to linear in outline, 3 to 7 lines long, pinnately parted or minutely pinnatifid into small (½ to 1½ lines long) entire or toothed segments; upper leaves less divided; racemes dense or loose, borne in corymbose panicles; pedicels shorter than the calyx; calyx-lobes about 2 lines long, unequal, foliaceous, 3 linear-lanceolate and entire, 2 broadly ovate, contracted into a petiole-like base and crenately toothed or incisely lobed or one of the two entire; corolla light-blue or lavender, open-campanulate, 2 to 2½ lines long, lobed to about the middle; scales

oblong, subcordate above; stamens slightly exserted or included; anthers purple; style twice as long as the corolla, deeply parted; capsule glabrous, acute at apex, shorter than the calyx, indehiscent, closely appressed to the solitary seed.

Sandy soil in partial shade of brush or rocks, 1000 to 2500 feet: Sierra Nevada foothills from Mariposa Co. to Fresno Co. Apr.-June.

Locs.—Mariposa Co.: Mt. Bullion (3 mi. s.), *Hoover* 3410; Mariposa, *Congdon;* Mormon Bar, *Congdon;* Pea Ridge road, *Congdon.* Madera Co.: Ahwahnee, *Jepson* 12,823. Fresno Co.: Big Sandy Valley, e. base Black Mt., *Hoover* 3468.

Refs.—PHACELIA PLATYLOBA Gray, Proc. Am. Acad. 17:223 (1882), type loc. Fresno Co., *Parry;* Jepson, Man. 822 (1925).

20. **P. tanacetifolia** Benth. VALLEY FIDDLE-NECK. (Fig. 403.) Stem erect, stout, often hollow, sparingly branched, 1¼ to 4 feet high, bristly-hirsute with scattered spreading hairs, the leaves thinly hispidulous, the racemes densely bristly-hirsute; leaf-blades ovate in outline, 6 to 9 inches long, once or twice pinnately divided or pinnatifid, often very finely divided, the ultimate pinnae 2 to 11 lines long and toothed or pinnatifid; racemes 2 to 4 inches long, ascending and compactly approximate in an umbel-like panicle, usually remote from the leaves; calyx-lobes linear, beset with rigid bristles, in fruit little exceeding the oval capsule; corolla blue, open-campanulate, 3 to 4 lines long, the lobes ascending; scales usually wholly adnate, tapering to apex, the pairs connivent in front of filament by the dilated middle portion; stamens exserted (1¼ to 2 times as long as corolla); ovules 2 in each cell; fruiting pedicels erect; capsule hairy only at apex.

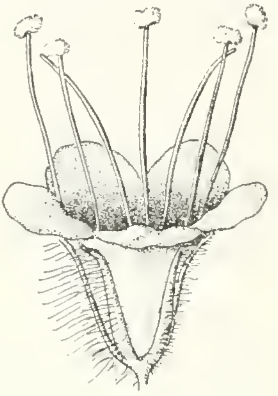
Fig. 403. PHACELIA TANACETIFOLIA Benth. Fl., × 5.

Sandy or clay foothills, plains or valley flats, 50 to 3000 feet: North Coast Ranges in Lake Co.; South Coast Ranges from Contra Costa Co. to San Luis Obispo Co.; Great Valley from Colusa and Sutter Cos. to Kern Co.; Tehachapi Mts.; Sierra Nevada (foothills and middle altitudes) from Stanislaus Co. to Kern Co.; southern Inyo Co.; central and western Mohave Desert; cismontane Southern California; northwestern Colorado Desert. South to Lower California, east to Arizona. Mar.-May.

Tax. note.—In Phacelia tanacetifolia the ovary and capsule are hairy only at apex. In Phacelia distans, P. ramosissima, and P. vallis-mortae the ovary and capsule are densely hairy, at least to below the middle. In all of these species the hairs of the ovary are essentially alike. In the case of Phacelia cicutaria (and its various forms) and P. cryptantha the hairs of the ovary and capsule are of two distinct kinds, a soft underlying puberulence mixed with bristles which usually arise from dark spots. As to other differences it may be noted that in Phacelia tanacetifolia, P. distans and P. ramosissima the calyx closely invests the capsule, whereas in P. cicutaria and its var. hispida and in P. cryptantha the calyx-lobes spread away from the capsule somewhat above its base.—R. F. Hoover.

Locs.—North Coast Ranges: Clear Lake (e. side), *M. S. Baker* 3976b (perhaps recently introduced). South Coast Ranges: Somersville, n. of Mt. Diablo, *Chesnut & Drew;* Alum Rock, Mt. Hamilton Range, *Elmer* 4720; Willow Creek School, cent. San Benito Co., *Jepson* 16,127; San Ardo, Salinas Valley, *Jepson* 19,085; San Luis Mt., San Luis Obispo Co., *R. W. Summers.* Great Valley: Stone Corral Cañon below Sites, Colusa Co., *Hoover* 3230; Butte Pass, Marysville Buttes, *Jepson* 21,032; Woodland, Yolo Co., *Blankinship;* Brentwood, e. Contra Costa Co., *Linda Gehringer;* Tracy, San Joaquin Co., *A. D. Tenney;* Romain sta., w. Stanislaus Co., *Jepson* 15,725; Delhi, Merced Co., *Jepson* 18,407; Arroyo Hondo wash (4 mi. n. of Cantua Creek), w. Fresno Co., *Jepson* 16,942; Arvin, s. of Bakersfield, *Edith A. Purer.* Tehachapi Mts.: Tejon Rancho, *Allison Krames.* Sierra Nevada: Knights Ferry, Stanislaus Co., *F. W. Bancroft;* Clough Cave, South Fork Kaweah River, *W. Fry* 336; Poso Mine, Poso Creek, Kern Co., *C. N. Smith* 61; Sharktooth Hill, Greenhorn foothills, ne. of Bakersfield, *Allison Krames.* Inyo Co.: Great Falls Cañon, Argus Mts., *Wheeler & Richardson.* Mohave Desert: Daggett (10 mi. s.), *Mary Beal;* Randsburg, *Heller* 7695; Kramer (10 mi. e.), *C. L. Hitchcock* 12,258; Lancaster (w. of), *Clokey & Templeton* 4659; Big Rock Creek, n. slope San Gabriel Mts., *Munz* 6813. Cismontane S. Cal.: Cuyama Valley, ne. Santa Barbara Co., *Munz* 13,601; Portal Ridge, n. Los Angeles Co., *Jepson* 17,066; Playa del Rey, Los Angeles, *Hall* 3775; Tujunga Cañon, San Gabriel Mts., *Peirson* 2101; San Bernardino, *Parish* 4514; Menifee, sw. Riverside Co., *Alice King;* Witch Creek, San Diego Co., *Alderson;* San Diego, *Dunn.* Colorado Desert: Chuckwalla Bench, *Hall* 5884; Murray Cañon, near Palm Sprs. of San Jacinto, *Peirson* 956; Myers Creek bridge, foot of Mountain Springs grade, *Jepson* 11,782.

Var. **hubbyi** (Mcbr.) Jepson & Hoover comb. n. Stem very stout, 2 to 3 feet high; leaf-blades large, 2¼ to 6¼ inches long, the leaflets or segments 1 to 2¼ inches long, incisely pinnatifid and toothed; racemes very dense, erect, several or many in a large compact cluster; racemes and calyces shaggy-hirsute.—Near the coast from Ventura Co. (Ojai Valley, Bull. S. Cal. Acad. 33: 173) to Los Angeles Co. (Tujunga Cañon, *Peirson* 2100; Elysian Park, Los Angeles; San Pedro, *T. Brandegee*).

Refs.—PHACELIA TANACETIFOLIA Benth., Trans. Hort. Soc. ser. 2, 1:479 (1835); Bot. Reg. t. 1696 (1835), type grown in England from seeds collected in Cal. by *Douglas;* Jepson, Fl. W. Mid. Cal. 438 (1901), ed. 2, 342 (1911), Man. 822, fig. 790 (1925). *P. tanacetifolia* f. *staminea* Brand, Univ. Cal. Publ. Bot. 4:216 (1912), type loc. Deer Creek, Tulare Co., *Purpus* 5687. *P. tanacetifolia* subvar. *tenuisecta* Brand, l.c., type loc. Marysville Buttes, Sutter Co. (not "Marysville"), *Jepson* 21,032. Var. HUBBYI Jepson & Hoover. *P. hispida* var. *hubbyi* Mcbr., Contrib. Gray Herb. 49:29 (1917), type loc. Ojai Valley, Ventura Co., *Hubby* 31; Jepson, Man. 823 (1925). *Phacelia commixta* Greene, Pitt. 5:21 (1902), type loc. San Bernardino, *Parish;* said to be allied to P. tanacetifolia but leaves not finely divided and stamens included.

21. **P. ramosissima** Dougl. Stems several from the woody root-crown, simple or branching above, diffuse or trailing, puberulent and usually with a few short scattered spreading bristles or rarely subglabrous, 1½ to 3¼ feet long; herbage glandular (especially near the inflorescence); leaf-blades ovate to oblong in outline, hirsutulous, 1 to 3 (or 5½) inches long, pinnately divided into 5 to 9 oblong and serrate or incised divisions or leaflets, these 3 to 9 lines long, the lower distinct, the upper more or less confluent; petioles ¼ to 1½ inches long; racemes borne in clusters of 2 or 3, the clusters set on the branched forks of the peduncles, the forks often divaricate; calyx-lobes obovate to oblong-spatulate or linear, often drawn down to a narrow claw-like base, twice the length of the capsule or longer; corolla sordid- or yellowish-white or bluish, campanulate, with rotate limb, 3 lines long; scales elongated or narrow, enlarged downward into a semi-orbicular undulate border; stamens and style somewhat exserted; seeds oblong, 1 line long.

Brushy slopes or about rocks in the foothills or mountains or in gravelly streambeds, 20 to 9500 feet: transmontane Sierra Nevada from Siskiyou Co. to Inyo Co.; Sierra Nevada (w. slope) from Butte Co. to Kern Co.; Tehachapi Mts.; Coast Ranges from Lake Co. to Monterey Co.; coastal Southern California from Santa Barbara Co. to San Diego Co. North to Washington, east to Utah, south to Lower California. Apr.-Aug.

Geog. note.—The geographic range of Phacelia ramosissima longitudinally is marked, since it extends from Washington south into Lower California and east into Utah, and is exceeded by no other species of this genus save the complex-aggregate, Phacelia magellanica. Its altitudinal range and its variety of physiographic situation is also considerable. It is found on the shore line near Monterey at about 20 feet altitude, and inhabits the southern Sierra Nevada in the Kern Cañon region on Soda Creek at 9500 feet altitude. It is also found in the cañons on the arid east side of the Sierra Nevada in Inyo and Mono counties, on the plateaus of Lassen County and in the cañons of the inner foothills of the Mt. Hamilton Range near the San Joaquin valley floor. By way of further contrast, it may be added that its habitats on the hill slopes near Tomales Bay in Marin County lie within twelve miles of Redwood (Sequoia sempervirens) colonies, and that in upper Napa Valley near Calistoga it occurs within two miles of Redwood groves. This species thus grows in a wide diversity of climatic and topographic areas. In so wide a geographic range there is to be noted some variation in vegetative characters of the plant, especially in size and segmentation of the leaf and in degree of pubescence and in glandulosity. These variations are only partially associated with geographic distribution.

All plants of Phacelia ramosissima throughout its range are glandular, or to some slight degree glandular, on the stems, or at least near the inflorescence. In general, cismontane Sierra Nevada plants tend to be less glandular than Coast Range plants. In the Coast Ranges the amount of glandular pubescence in this species increases southward and is most marked in coastal Southern California, or somewhat marked in the region along the coast line from Monterey south. All plants, in some degree, have the stems hispid or hirsute with spreading hairs, varying from near subglabrous to rather densely bristly-hirsute; the stems are, in addition, commonly puberulent. In aspect, in habit and in leaf character the species is most uniform on the west slope of the

Sierra Nevada. The transmontane representation tends on the whole to approximate in some particulars that of coastal Southern California. Sometimes, at widely scattered stations, the stems are markedly woody at base (var. suffrutescens Parry), a condition that is a matter of age (field observation by F. W. Peirson) and is not definitely and consistently associated with any other feature.

Locs.—Transmontane Sierra Nevada: Yreka; Patterson Mill, Warner Mts., *L. S. Smith* 1015; Eagle Lake, Lassen Co., *M. S. Baker;* Dog Valley, e. Sierra Co., *Nordstrom* 908; Walker Lake, Mono Co., *Jepson* 4449; Cottonwood Creek cañon, w. Inyo Co., *Purpus* 1936. Cismontane Sierra Nevada: Big Chico Creek, Butte Co., *Heller* 11,517; Summit sta., Nevada Co., *Jepson* 21,033; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 454; Silver Valley, Alpine Co., *Jepson* 10,149; Crane Flat, Mariposa Co., *Jepson* 4644; Huntington Lake, Fresno Co., *A. L. Grant* 1169; Bubbs Creek (near Charlotte Creek), Fresno Co., *Jepson* 814; near Cahoon Mdw., w. of Mt. Silliman, n. Tulare Co., *Jepson* 739; Poso Mine, Poso Creek, Kern Co., *C. N. Smith* 213. Tehachapi Mts.: Bisses sta., *Dudley* 351. Coast Ranges: Gravelly Valley, n. Lake Co., *Jepson* 21,035; Mt. Konocti, Lake Co., *Jepson* 21,034; Berkeley Hills, *Mulliken* 67; Presidio, San Francisco, *M. S. Baker;* Pacific Grove, *Elmer* 4403; Nacimiento River (w. of Jolon), Monterey Co., *Jepson* 1699; upper Cholame Creek, se. Monterey Co., *Jepson* 15,898. Cismontane S. Cal.: Seymour Creek, Mt. Piños, *Hall* 6675; Valdez Harbor, Santa Cruz Isl., *A. L. Grant* 1714; Manhattan Beach, Los Angeles coast, *Bettys;* San Bernardino Valley, *Jepson* 5534; Strawberry Valley, Mt. San Jacinto, *Jepson* 2269; Escondido, *C. V. Meyer* 227; Del Mar, San Diego Co., *Jepson* 1603a.

A form growing in Southern California with the stems more hispid and puberulent (var. subsinuata Mcbr.) is illustrated by: Mohave River headwaters, *Parry & Lemmon* 262; Playa del Rey, Los Angeles coast, *Parish* 11,870; Newport Bay, *Booth* 1060. From this form there are numerous shades of intergradation to usual forms of the species in which the stems are markedly hispid to scantily hispid or merely puberulent or subglabrous.

Tax. note.—There seems to be no constant difference that is marked between Phacelia ramosissima and P. distans save in habit and in duration. In most cases P. ramosissima has leaves less finely divided than in P. distans and with more rounded lobes. The corolla-scales differ, although in P. distans they are variable. In P. distans the scale is short vertically, about equaling the lateral lobe of the scale (rarely twice as long in the form called Phacelia ammophila Greene). In P. ramosissima the scale is elongate with its lateral lobe small.—R. F. Hoover.

Refs.—PHACELIA RAMOSISSIMA Dougl.; Benth., Trans. Linn. Soc. 17:280 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 437 (1901), ed. 2, 341 (1911), Man. 823 (1925). *P. decumbens* Greene, Pitt. 5:17 (1902), type loc. Yreka, *Greene* 896. *P. ramosissima* f. *decumbens* Brand, Univ. Cal. Publ. Bot. 4:215 (1912). *P. fastigiata* Greene, Pitt. 5:18 (1902), type *Palmer* 205, collected in Long Mdw., Tulare Co., not at "some uncertain station in the mountains of Kern Co." *P. polystachya* Greene, Pitt. 5:19 (1902), type loc. Witch Creek, San Diego Co., *Alderson.* *P. suffrutescens* Parry, Proc. Davenp. Acad. Sci. 4:38 (1884), type from S. Cal., *Parry.* *P. ramosissima* var. *suffrutescens* Parry; Gray, Syn. Fl. ed. 2, 2:416 (1886); Jepson, Man. 823 (1925). *P. ramosissima* f. *suffrutescens* Brand; Engler, Pflzr. 4^{251}:92 (1913). *P. bifurca* Greene, Pitt. 5:18 (1902), type loc. Tehachapi, *Greene.* *P. subsinuata* Greene, Pitt. 5:19 (1902), type loc. San Rafael Mts., Santa Barbara Co., *Spence.* *P. ramosissima* var. *subsinuata* Mcbr., Contrib. Gray Herb. 49:30 (1917); Jepson, Man. 823 (1925).

22. **P. umbrosa** Greene. Stems slender, weak, branching, 1 to 1½ feet high; herbage thinly or sparingly hirsutulose or subglabrous; leaves ovate in outline, 1½ to 3 inches long, pinnate or pinnately divided into 5 leaflets or divisions, the leaflets or divisions ovate, shallowly and incisely lobed to crenate, ½ to 1½ inches long, at least the lower with petiolules; racemes rather slender, mostly dense, elongated; calyx-lobes linear, acute, long-hispid; corolla white, tubular-campanulate, 1½ to 2½ lines long, shorter than or barely equaling the calyx-lobes; corolla-scales broadly united below, strongly dilated upwards; seeds 4, densely papillate.

Desert flats or slopes, 500 to 1500 feet: southwestern Colorado Desert. South to northern Lower California. July.

Tax. note.—Phacelia umbrosa is nearly related to P. distans. Almost nothing is known of its ontogeny. While it has been once collected within the limits of California, namely, in the southwestern Colorado Desert by C. R. Orcutt, no exact station is known for it. In southern cismontane San Diego County there appear to be forms of Phacelia distans which simulate P. umbrosa in flowers and somewhat in leaves, as at Descanso.

Refs.—PHACELIA UMBROSA Greene, Erythea 2:191 (1894), type from n. L. Cal., *Orcutt* in 1885. *P. hispida* var. *umbrosa* Brand; Engler, Pflzr. 4^{251}:88 (1913).

23. **P. distans** Benth. Stem erect and strict, or branching and diffuse, 8 to 23 inches high; herbage with scattered hispid hairs and close fine pubescence; leaf-blades 1 to 4 inches long, ovate or oblong in outline, pinnately divided, the divisions

commonly linear or oblong in outline, once or twice pinnately and (for the most part) finely dissected, the ultimate segments ½ to 3 (or 11) lines long; petioles ¼ to 1 inch long, or the uppermost leaves sessile; racemes scattered, solitary or geminate, at maturity divergent, often subtended by the upper leaves; calyx-lobes unequal, lanceolate, oblanceolate or narrowly oblong, rarely linear; corolla rotate-campanulate, sordid white, blue, or violet, 3 to 4 lines long, its scales short, strongly lobed or broadened at the middle, spreading transversely and so curved as to be a little dome-shaped or inversely bowl-shaped, at base united to the filaments and thus forming a slight sac behind the filaments; stamens shorter than the corolla or a little exserted; fruiting pedicels ascending; capsule globose, hairy to at least below the middle.

Loamy or sandy soil, valleys and foothills, or rocky hill slopes or sliding talus in desert cañons or mesas, 10 to 5000 (or 7400) feet: Coast Ranges from Tehama and Mendocino Cos. to San Luis Obispo Co.; San Joaquin Valley; Tehachapi Mts.; southern Sierra Nevada from Tulare Co. to Kern Co.; Mono and Inyo Cos.; Mohave Desert; Colorado Desert; cismontane Southern California. East to Nevada and Arizona, south into Lower California. Mar.-June.

Locs.—North Coast Ranges (rare): Wimmeshaw, foothills below Mt. Tom, w. Tehama Co., *Jepson* 21,015; Hopland (s. of), Mendocino Co., *Abrams* 7043; Santa Rosa Creek Cañon, Sonoma Co., *M. S. Baker;* Pope Creek, Napa Co., *Jepson* 10,412; St. Helena (mts. w.), *Jepson* 21,016; Benicia Hills, *Jepson* 18,749; Ross Valley, Marin Co., *Jepson* 21,014. South Coast Ranges (common): Telegraph Cañon, Berkeley Hills, *Jepson* 3000; Mt. Diablo, *Bowerman* 300; Lake Merced, San Francisco, *Jepson* 2629; Crystal Sprs., San Mateo Co., *C. F. Baker* 442; Mt. Day, Mt. Hamilton Range, *R. J. Smith;* Puerto Cañon, w. Stanislaus Co., *Hoover* 850; San Jose (4 mi. s.), *Hoover* 3253; Monterey, *Jepson* 21,065; Paso Robles, *Benj. Cobb;* San Carlos Creek, w. Fresno Co., *Jepson* 2725; Zapato Creek, sw. Fresno Co., *Jepson* 15,356; San Luis Mt., *Summers.* San Joaquin Valley (represented in this region chiefly by the var. ammophila (Greene), the plants coarse, the calyces bristly-hirsute; also recurring sporadically southward and passing into the ordinary form): Antioch, *Hoover* 2116; betw. Mossdale School and Atlanta, San Joaquin Co., *Jepson* 21,013; Modesto (10 mi. s.), *Hoover* 2134; Delhi, Merced Co., *Jepson* 18,407; Chowchilla, Madera Co., *Hoover* 4006; Oil City near McKittrick, *Heller* 7745. Tehachapi Mts.: Caliente, *Jepson* 6749; Bear Mt., *Jepson* 7184; Tehachapi, *K. Brandegee.* Southern Sierra Nevada from Tulare Co. to Kern Co.: Bear Creek, Tulare Co., *Purpus* 1738; Lavers ranch, Greenhorn Mts., *Allison Krames;* Piute Mts., *C. N. Smith* 168. Mono Co.: Benton, *Shockley* 127. Inyo Co.: Big Pine, *Almeda Nordyke;* Oak Creek, *Renner* 53; Cottonwood Creek cañon, *Purpus* 3014; Hanaupah Cañon, Panamint Mts., *Jepson* 6968; Cowans sta., *Renner* 38. Mohave Desert: New York Mts., *Jepson* 5471; Providence Mts., *Jepson* 18,313 (range e. of Domingos ranch), 18,343 (Hole-in-the-Wall); Searles Lake, *Allison Krames;* Granite Mts., s. of Avawatz Mts., *Jepson* 17,307; Hawes sta., *Newlon* 490; Jim Grey sta. (w. of Barstow), *Jepson* 15,560; Lancaster (6½ mi. w.), *Jepson* 17,055. Colorado Desert: Cottonwood Spr., Eagle Mts., *Jepson* 12,567; Painted Cañon, Mecca, *Jepson* 11,672; Andreas Cañon, San Jacinto Mts., *Newlon* 437; Indian Wells (6 mi. w.), Coachella Valley, *Newlon* 425; San Felipe Narrows, *C. V. Meyer* 35; Blair Valley, e. San Diego Co., *Jepson* 8688; Vallecito, e. San Diego Co., *Jepson* 8570; Myers Creek bridge, foot of Mountain Sprs. grade, *Jepson* 11,782. Cismontane S. Cal.: North Fork Lockwood Creek, Mt. Piños, *Hall* 6472; Mission La Purisima, Santa Barbara Co., *Jepson* 11,933; Santa Rosa Isl., *T. Brandegee;* Bouquet Cañon, n. Los Angeles Co., *Clokey & Templeton* 4760; Arroyo Seco, San Gabriel Mts., *Peirson* 311; Cajon Pass, *Jepson* 6103; Waterman Cañon, San Bernardino Mts., *Jepson* 5526; San Jacinto River cañon, w. Riverside Co., *Jepson* 1276; Chalk Hill, Mt. San Jacinto, *C. V. Meyer* 753; Anaheim plain, Orange Co., *Alice King;* Elsinore, sw. Riverside Co., *Jepson* 19,139; Pala, San Diego Co., *Jepson* 8500; Palomar Mt., *C. V. Meyer* 502; Mesa Grande, San Diego Co., *E. Ferguson* 21; betw. La Jolla and Del Mar, San Diego Co., *Newlon* 300; Descanso, *Epling.* A form (var. scabrella Brand) with coarser stems, slightly rougher pubescence and more numerous racemes inhabits the Santa Barbara Isls.: San Miguel; Santa Rosa, *T. Brandegee.*

Refs.—PHACELIA DISTANS Benth., Bot. Sulph. 36 (1844), type loc. Bodega, Sonoma Co., *Hinds;* Jepson, Fl. W. Mid. Cal. 438 (1901), ed. 2, 341 (1911), Man. 823 (1925). *P. scabrella* Greene, Pitt. 1:35 (1887), type loc. San Miguel Isl., *Greene.* *P. distans* var. *scabrella* Brand; Engler, Pflzr. 4^{251}:90 (1913). *P. arthurii* Greene, Pitt. 1:224 (1888), type loc. Oakland, *Arthur Simonds.* *P. leptostachya* Greene, Erythea 2:190 (1894), type loc. Alameda, *Greene.* *P. distans* subvar. *leptostachya* Brand; Engler, Pflzr. 4^{251}:89 (1913). *P. distans* subvar. *ammophila* Brand, Univ. Cal. Publ. Bot. 4:216 (1912), type *C. F. Baker* 2806 (Antioch as per herb. label); Engler, Pflzr. 4^{251}:89 (1913). The foregoing subvarietal name is based on *P. ammophila* Greene in Baker, W. Am. Plants, 2:15 (1903), middle western Cal., *C. F. Baker* 2806 (nomen nudum). *P. distans* var. *australis* Brand, Univ. Cal. Publ. Bot. 4:216 (1912), type loc. Greenhorn Range, Kern Co., *Hall & Babcock* 5071. *P. tanacetifolia* var. *pseudodistans* Brand; Engler, Pflzr. 4^{251}:91 (1913), type loc. Red Mts., w. Stanislaus Co., *Elmer* 4338. *P. cinerea* Eastw., in Mcbr., Contrib. Gray Herb. 49:26 (1917), type loc. San Nicolas Isl., *Trask*, is a synonym acc. P. A. Munz; an annual plant might be described as a perennial and there would be little else to distinguish it from P. distans (R. F. Hoover). *P. ramosissima* var. *cinerea* Jepson, Man. 823 (1925). *P. tanacetifolia* var. *cinerea* Brand, Univ. Cal. Publ. Bot. 4:216 (1912), type loc. Argus Range, Inyo Co., *Purpus* 5042, may belong here.

24. **P. vallis-mortae** Voss. Stems erect, usually branching at or above the base, set with scattered spreading bristles, 9 to 15 inches high; leaf-blades glandular-puberulent and appressed-hirsute, pinnately divided, 1 to 2 inches long, the divisions remote, entire, incisely toothed or pinnatifid, ½ to 1 inch long; racemes dense, rather short; calyx-lobes linear-oblanceolate, acute, puberulent and bristly; corolla lavender, 3 to 5 lines long, its lobes rounded, over-lapping at base; scales at base connivent in pairs over base of filaments, retrocurved outward, then running straight upward, adnate but with free lance-shaped or ovate tips; stamens included or a little exserted, glabrous; ovary densely clothed with straight erect hairs.

Brushy desert slopes or flats, 2100 to 7300 feet; eastern Mohave Desert; Inyo Co.; southern Mono Co. East to Utah. May-June.

Tax. note.—In its narrow calyx-lobes, bristly inflorescence and often long pedicels this species is allied to Phacelia cicutaria var. hispida; in other respects it draws close to P. distans. Before anthesis the calyx-lobes are already quite long and arch high, loosely connivent by their tips above the corolla-bud, thus leaving a free space between the summit of the corolla-bud and the summit of the calyx (Ord Mt., *Jepson* 15,489). In Phacelia distans, before anthesis, the tips of the calyx-lobes stand free and erect about the corolla-bud; in anthesis the calyx-lobes are somewhat broad and tend to half-conceal (sometimes they wholly conceal) the corolla-throat. In anthesis, the narrow calyx-lobes of Phacelia vallis-mortae spread widely and cover little of the corolla throat. At the base of the filaments the pairs of corolla-scales in Phacelia vallis-mortae overlap. The filaments thus appear set in a sort of open cup; behind each filament is a round semi-transparent area or spot in the tube of the corolla. The style is divided nearly to the base.

Locs.—Eastern Mohave Desert: Barstow, *Jepson* 5827; Lone Willow Spr., *Parish* 10,131; Lanfair Valley, *Munz* 13,707. Inyo Co.: Slate Range, *Allison Krames;* Shoshone (10 mi. sw.), *C. L. Hitchcock* 12,343; Emigrant Cañon, Death Valley, *C. N. Smith* 96; Bishop Creek, *Hall & Chandler* 7268; Westgard Pass, *Jos. Grinnell* 1042a. Mono Co.: Watterson Mdw., *Renner* 3.

Ref.—PHACELIA VALLIS-MORTAE Voss, Bull. S. Cal. Acad. 33:175, pl. 56, fig. 5 (1935), type loc. Keane Spr., Funeral Mts., Inyo Co., *Munz* 12,580.

25. **P. cicutaria** Greene. Stem erect, branching, 1 to 2 feet high; herbage puberulent and thinly spreading-bristly, somewhat glandular-viscid; leaf-blades 2 to 5 inches long, pinnately divided into distinct segments or leaflets, or the larger terminal segment merely pinnatifid or lobed; leaflets ¼ to 1 (or 2¼) inches long, serrate or rather coarsely cleft-toothed, the lobes or teeth usually upwardly pointed, or yet again the leaflets finely pinnatifid; racemes rather dense, in 2s or 3s on the ends of the branches, 1 to 4 inches long; calyx-lobes narrowly linear, thickly set with horizontally spreading bristles; corolla dingy white or pale lavender-white, with translucent brownish spots in the throat, never blue; scales adnate to corolla on one side and to the stamen-filament on the other, the pair thus forming a deep v-shaped pocket behind the filament, each scale with a very small acute free lobe above the corolla attachment and a larger free lobe above the filament attachment, this upper free margin often dentate; stamens included or only slightly exserted; seeds ¾ to 1¼ lines long.

Gravelly or rocky slopes, Sierra Nevada foothills from Butte Co. to Kern Co. and the margin of the bordering Great Valley plain; Tehachapi Mts. Mar.-May.

Locs.—Sierra Nevada foothills: Iron Cañon, Butte Co., *R. M. Austin* 5 ("represents P. heterosepala Greene, apparently a shade form of P. cicutaria."—R. F. Hoover); Feather River above Oroville, *Heller* 10,709; Drytown, Amador Co., *Hansen* 266; Linden, ne. San Joaquin Co., *Gunnison;* Table Mt., Fresno Co., *Jepson* 15,129; Hughes Mt., Kings River, *Hoover* 3930; Tulare, *Davy:* Kaweah, Tulare Co., *Hopping* 528; Olcese ranch, Poso Creek, Kern Co., *Allison Krames;* lower Kern Cañon, Greenhorn Mts., *Allison Krames.* Tehachapi Mts.: Rowen, *Jepson* 6730; Keene, *Jepson* 7163.

Var. **heliophila** (Mcbr.) Jepson comb. n. Leaves small, the leaflets 4 to 7 lines long, the lower finely divided and fern-like (in this respect simulating P. distans); corolla light blue, with darker veins, very showy, 6 lines long; scales similar to the species but the lobe above corolla attachment narrowly lanceolate or linear and much longer, the lobe above filament attachment rounded and shorter; stamens dark purple, exserted; seeds 1½ to 2 lines long.—Open slopes or washes, western margins of the upper San Joaquin Valley from Fresno Co. to Kern Co.

Field note.—In the field, when once its characters are understood, Phacelia cicutaria var. heliophila is competently recognized in its main distribution area. It occurs notably in Zapato Cañon, easterly foothills of the Diablo Range in southwestern Fresno County. Zapato Creek, a shallow wash of the San Joaquin Valley plain, cuts westward into the Kreyenhagen Hills and forms a deep cañon with abrupt walls on both sides. Within three hundred yards after entering Zapato Cañon, one is confronted in mid-April with a striking colony of Phacelia cicutaria var. heliophila (*Jepson* 15,372). It begins as a broad band at the cañon floor and rises steeply up the slope to the summit of the north wall of the cañon and is framed right and left by outcropping rock-ledges that parallel each other. It is a dense and almost pure colony growing in gravelly and rocky soil. This variety has also been found in Piedra Azul Cañon, w. Merced County (*Hoover* 4379), in the Arroyo Hondo wash (four miles north of Cantua Creek), in western Fresno County (*Hoover* 1872), at Alcalde in southwestern Fresno County (*T. Brandegee*), and at Sunset near Maricopa in Kern County. All these localities are in or near the foothills of the inner South Coast Range, that is, the easterly foothills on the San Joaquin Valley side of the range.

Var. **hispida** (Gray) Jepson comb. n. CATERPILLAR PHACELIA. Stems diffusely branched or erect and subsimple, ¾ to 2 feet high; stems and petioles and leaf-blades minutely puberulent and with long spreading white bristles; herbage not glandular or rarely slightly so; leaf-blades broadly oblong in outline, 1 to 4 inches long, pinnately divided, the leaflets mostly distinct, discrete and toothed or deeply or variously incised, ½ to 2¼ inches long, or the uppermost leaves smaller and merely toothed or laciniate-incised; petioles ½ to 1½ inches long; racemes in age not dense, the pedicels ¼ or ½ to 1 line long; calyx-lobes narrow-oblanceolate or linear, slender-attenuate downward, densely set with long spreading white bristles; corolla pale blue or lavender (often with a dark blue dot in tube opposite each sinus), 3 to 4½ lines long, 4 to 7 lines wide, 1½ to 2 times as long as the calyx; stamens well or scarcely exserted; fruiting calyx-lobes 4 to 5 lines long, 1½ to 2 times as long as the globose capsule, often spreading above the very base; seeds ¾ to 1¼ lines long.—Gravelly or rocky slopes or in sandy soil of plains, foothills and cañons, 450 to 5700 (or 7300) feet: cismontane and intramontane Southern California. South to Lower California. Apr.-July. In Ventura and Los Angeles counties this plant is well-known to beekeepers.

Relation of the var. hispida to the species Phacelia cicutaria.—The leaves of Phacelia cicutaria, Sierra Nevada foothills, show a yellowish or brownish cast, whereas those of the var. hispida, Southern California, are dark green or perhaps somewhat grayish on account of the pubescence. The corolla in Phacelia cicutaria is dull white or whitish-lavender with translucent spots in the throat opposite each sinus. The corolla in the var. hispida is a uniform blue, lavender or white, sometimes with a dark blue spot in throat opposite each sinus.

In these two forms, Phacelia cicutaria and its variety hispida, the corolla-scales are alike and different from those of any other species of Phacelia. The scales are adnate to corolla on one side and to base of filaments on the other side, the pair thus forming a deep v-shaped pocket behind the filament. There is also to be observed a small acute free tip above attachment to corolla and a larger free tip above the attachment to filament. The free margin of the scales is usually more or less fimbriate or lacerate.

The oldest specific name in this group, Phacelia hispida Gray (1878), resting initially on Southern California coast line plants, is antedated by the homonym, Phacelia hispida Buckley (1862). The next oldest name, which is here accepted as the specific name for the group, is Phacelia cicutaria Greene (1902), the plant of the Sierra Nevada foothills. The Southern California plant is, therefore, disposed as var. hispida (Gray) under Phacelia cicutaria, because Gray first described it as a variety in 1875.

Leaf variation.—In Phacelia cicutaria var. hispida the leaflets or segments of the leaf-blades vary much both in size and shape. A prevailing leaf form is that with small (¼ to ½ inch long) narrow leaflets, the leaflets toothed or pinnately incised or parted with toothed lobes. Frequently found is a form with large oblong or suborbicular leaflets (½ to 1 inch wide). These two plant forms are sometimes associated; when associated and without intergrades they are strikingly unlike in leaf aspect but apparently alike in habit and size of plants and in inflorescence and flowers and in other respects. Nevertheless, this marked contrast in the two states, so often noted by the field observer, especially when plants are growing side by side, stirs a question in the mind as to their genetical values. Over the general coastal range of the species, however, there is every apparent intergrade.

Locs.—Western Colorado Desert: Mission Creek (nw. of Garnet), Conchilla Desert, *Clary* 1601; Palm Springs, Mt. San Jacinto, *Gilman* 714; Andreas Cañon, San Jacinto Mts., *Newlon* 436. Cismontane S. Cal.: Santa Cruz Isl., *Greene;* Santa Barbara, *T. Brandegee;* Ojai Valley, Ventura Co., *Thacher* 37; San Francisquito Pass, n. Los Angeles Co., *Hall* 3097; Henninger Flats, San Gabriel Mts., *Peirson* 161; Cajon Pass, *Jepson* 6111; San Bernardino foothills, *Parish;* Coyote Cañon, Santa Rosa Mts., *Hall* 2782; Santa Ana Cañon, Orange Co., *Alice King;* Pala, San

Diego Co., *Jepson* 8496; Escondido, San Diego Co., *C. V. Meyer* 226; San Pasqual Valley, San Diego Co., *Jepson* 19,179; La Junta near Jamul, *Newlon* 341.

Refs.—PHACELIA CICUTARIA Greene, Pitt. 5:20 (1902), type loc. Knights Ferry, Stanislaus Co., *F. W. Bancroft* (typ. vidi). *P. hispida* var. *cicutaria* Mcbr., Contrib. Gray Herb. 49:28 (1917); Jepson, Man. 823 (1925). *P. hispida* subvar. *cicutaria* Brand, Univ. Cal. Publ. Bot. 4:215 (1912); Engler, Pflzr. 4^{251}:87 (1913). *P. heterosepala* Greene, Pitt. 5:21 (1902), type loc. Iron Cañon, Butte Co., *Austin*. *P. hispida* subvar. *heterosepala* Brand, Univ. Cal. Publ. Bot. 4:215 (1912). *P. hispida* var. *heterosepala* Voss, Bull. S. Cal. Acad. 33:173 (1935). Var. HELIOPHILA Jepson. *P. hispida* var. *heliophila* Mcbr., Contrib. Gray Herb. 49:29 (1917), type loc. Sunset, Kern Co., *Heller* 7730. *P. vallis-mortae* var. *heliophila* Voss, Bull. S. Cal. Acad. 33:176 (1935). Var. HISPIDA Jepson. *P. ramosissima* var. *hispida* Gray, Proc. Am. Acad. 10:319 (1875), based on material from "Santa Barbara to San Diego." *P. hispida* Gray, Syn. Fl. 2:161 (1878), "Santa Barbara to San Diego," *Nuttall;* Jepson, Fl. W. Mid. Cal. ed. 2, 341 (1911), Man. 823 (1925); not P. hispida Buckley, Proc. Acad. Phila. 1861:463 (1862). *P. eximia* Eastw., Bull. Torr. Club 32:304 (1905), type loc. Mt. Wilson, *Grinnell*. *P. hispida* var. *eximia* Voss, Bull. S. Cal. Acad. 33:172 (1935).

26. **P. cryptantha** Greene. LIMESTONE PHACELIA. Stems widely branched from the base, diffusely decumbent and forming a low rounded plant 4 to 9 inches high and 2 to 3 times as broad, rather dense and of "soft" appearance; herbage thinly set with spreading bristles; leaf-blades 1¼ to 2½ inches long, pinnately divided into 5 to 7 divisions or leaflets, these elliptic to round-obovate, crenate, 4 to 9 lines long, the lower ones discrete and distinctly petiolulate; petioles ½ to mostly as long or longer than the blade; upper leaves similar to the lower, or small and merely toothed or 3-lobed or -divided; racemes 3 to 4 inches long in fruit, not very dense, the pedicels 1½ to 2½ lines long; calyx-lobes narrow-oblanceolate or spatulate, rather densely set with long white spreading bristles or in early anthesis often tufted with bristles on lower part, accrescent in fruit and 4 to 5 lines long; corolla white or pale lavender, tubular-campanulate, 2 lines long, shorter than or not exceeding the calyx; scales semi-ovate, wholly adnate, inserted in upper part of tube proper, at base narrowly joined in pairs to filament; stamens exserted from the corolla-throat, a little shorter than the corolla-lobes; capsule globose, ¼ as long as fruiting sepals; seeds 4, irregularly foveolate.

Arid mountain slopes, mostly desert ranges, 4000 to 5000 feet: southern Sierra Nevada in Fresno Co.; Inyo Co.; western Colorado Desert. East to Arizona. May.

Field note.—Phacelia cryptantha was discovered in the Panamint Range by the Death Valley Expedition. The botanist of the expedition, F. V. Coville, described it as Phacelia hispida var. brachyantha. In its prevailing and most characteristic form it is shortly branched, low and dense, always very much broader than high, the herbage tender. It is, thus, in aspect and habit, as a distinctive desert type, remotely different from the tall erect sparingly branched plant, Phacelia hispida Gray, of cismontane California, which is now, by reason of a prior homonym, to take the name, P. cicutaria var. hispida (Gray).

In Phacelia cryptantha the corollas are shorter than the calyx or only equaling it. Excised promptly after anthesis, and aging sordid or sometimes purplish, they cling to the calyx for a period and thus give an appearance of exceeding the calyx in length. The calyces at base are so densely hispid that such tufts of hairs appear, in the field, like woolly spots.

Locs.—S. Sierra Nevada: Tehipite Valley, Fresno Co., *Hall & Chandler* 481. Inyo Co.: Lone Pine Creek, Alabama Hills, *Hall & Chandler* 7182; Cottonwood Cañon, Death Valley, *Gilman* 4056; Hanaupah Cañon, Panamint Range, *Jepson* 7079; Johnson Cañon, Panamint Range, *Jepson* 19,591. Eastern Mohave Desert: Granite Mts., s. of Avawatz Mts., *Jepson* 17,304; Willow Springs Cañon, Old Dad Mts., *Jepson* 20,441; Chukar Cañon, Providence Mts., *Mary Beal* 804. Western Colorado Desert: Indian Cañon, Collins Valley, ne. San Diego Co., *Jepson* 8852.

Refs.—PHACELIA CRYPTANTHA Greene, Pitt. 5:21 (1902); Jepson, Man. 824 (1925). *P. hispida* var. *brachyantha* Cov., Contrib. U. S. Nat. Herb. 4:158 (1893), type loc. Surprise Cañon, Panamint Mts., *Funston* 607. *P. cryptantha* var. *derivata* Voss, Bull. S. Cal. Acad. 33:174 (1935), type loc. Shepherd Cañon, Argus Range (not "Panamint Range"), *Jones*. *P. eremica* Jepson, Man. 823 (1925), type loc. Collins Valley, ne. San Diego Co., *Jepson* 8852.

27. **P. ciliata** Benth. (Fig. 404.) Stem branched at and above the base, 9 to 14 inches high, the branches few, rather simple, stout, ascending; herbage scabrous-pubescent; leaf-blades oblong or ovate in outline, 1 to 3 inches long, pinnately di-

vided, the divisions oblong (not narrowed toward base), toothed or pinnately incised; spikes in terminal clusters or pairs or solitary; calyx-lobes ½ to ¾ as long as corolla; corolla blue, deeply bowl-shaped, 3 to 4½ lines long, its scales suborbicular, spreading horizontally, partly free; capsule ovate, mucronate; calyx-lobes in fruit twice as long as in flower, oblong-lanceolate to broadly ovate, chartaceous with thickened margins and prominent midrib, markedly venulose, sparsely bristly-ciliate, 3 to 5 lines long, arched over the capsule, their tips meeting.

Adobe or clay soil of valley floors and open hills, or on alkaline flats, 20 to 5200 feet: South Coast Ranges from San Francisco and Contra Costa counties to San Luis Obispo Co.; Sacramento Valley, west side from Glenn Co. to Solano Co.; San Joaquin Valley, west side except at the south end; southern Sierra Nevada foothills from Tulare Co. to Kern Co.; Tehachapi Mts.; western Mohave Desert; cismontane Southern California from northern Ventura Co. to western Riverside Co. South to Lower California. Mar.-May.

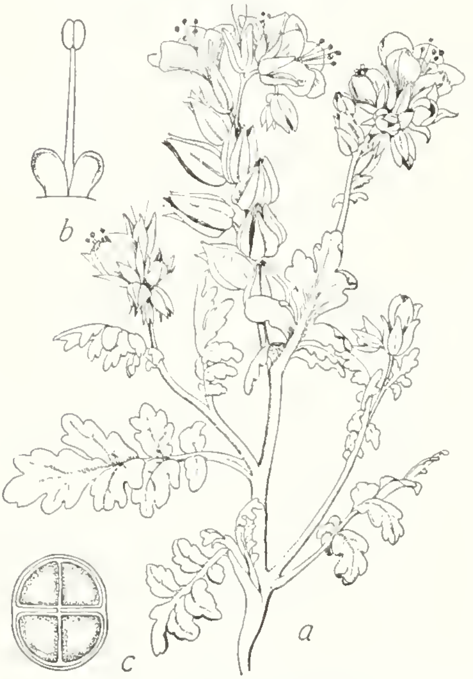

Fig. 404. PHACELIA CILIATA Benth. *a*, habit, × 1½; *b*, stamen and scales, × 2½; *c*, x-sect. of ovary, × 4½.

Field note.—As a part of the primitive flora of the valley levels of California, Phacelia ciliata, an early spring-flowering annual, was a conspicuous element. It is an instance of a native species which has adapted itself successfully to the changes brought about by modern agriculture and often colonizes grain fields for miles, as well as orchards. It flowers early, matures its capsules and scatters its seeds usually before plowing in the orchards and always before harvesting in grain fields. It has undoubtedly been disseminated to some degree in grain seed. The occurrence at Eureka (*Tracy* in 1899) probably owes its origin to impure sowings. In regions less disturbed by modern agriculture, as about Parkfield in southeastern Monterey County, areas of 30 to 200 acres in which this species is the dominant, still empurple the valley floors and the low foothills.

Locs.—South Coast Ranges: Summerville, Contra Costa Co., *Chesnut & Drew;* Burlingame, San Mateo Co., *Inez Smith;* Corral Hollow, n. Mt. Hamilton Range, *Jepson* 9565; Warm Springs, sw. Alameda Co., *Jepson* 9098; Lewis Creek, s. San Benito Co., *Jepson* 16,147; Diablo Range, sw. Fresno Co., *Jepson* 15,399; Parkfield, se. Monterey Co., *Jepson* 16,170; Mission San Miguel, San Luis Obispo Co., *Jepson* 8438; Simmler, Carriso plain, se. San Luis Obispo Co., *Jepson* 16,207. Sacramento Valley (west side): Willows, *Jepson* 21,010; College City, Colusa Co., *Ruth Johnson;* Collinsville, s. Solano Co., *Jepson* 21,012. San Joaquin Valley (west side except at the south): Tracy, San Joaquin Co., *Jepson* 9593; Los Banos (gypsum hills 10 mi. s.), *Hoover* 2880; Oxalis sta. (near Firebaugh), w. Fresno Co., *Jepson* 15,350; Helm, cent. Fresno Co., *Hoover* 1787; Coalinga (6 mi. ne.), *C. V. Meyer;* McKittrick, w. Kern Co., *Heller* 7784. Southern Sierra Nevada foothills: Stokes Valley, Tulare Co., *H. P. Kelley;* Rancheria Gulch, Poso Creek, Kern Co., *C. N. Smith* 52. Tehachapi Mts.: Tehachapi Valley, *Allison Krames.* Western Mohave Desert: Antelope Valley (Erythea 3:155). Cismontane S. Cal.: Lockwood Valley, Mt. Piños, *Hall* 6484; Garvanza, Los Angeles Co., *Geo. B. Grant* 962; Temescal, sw. Riverside Co., *Hall* 394.

Var. OPACA J. T. Howell is a form with narrow dull or dark (not shining) calyx-lobes; it grows on the plains of eastern Merced Co. (Tuttle, *Hoover* 1752; Planada, *J. T. Howell* 4202). On the east side of the upper San Joaquin Valley (Ducor, Tulare Co., *Hoover* 3920), Phacelia ciliata tends to grade towards this variety (R. F. Hoover).

Refs.—PHACELIA CILIATA Benth., Trans. Linn. Soc. 17:280 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 437 (1901), ed. 2, 341 (1911), Man. 824, fig. 791 (1925). *P. acantho-*

minthoides Elmer, Bot. Gaz. 41:309 (1906), type loc. Hernandez, San Benito Co., *Lathrop*. Var. OPACA J. T. Howell, Lflts. West. Bot. 1:221 (1936), type loc. Merced (5 mi. ne.), *J. T. Howell* 4192.

28. **P. thermalis** Greene. Stems with few or many branches from the base, 3 to 12 inches high; herbage thinly puberulent and hirsutulous; leaf-blades ovate in outline, 1 to 1¾ inches long, pinnately cleft or divided into 5 or 7 segments, the lower pair usually distinct and discrete; racemes dense, 1 to 3 inches long; calyx-lobes oblong-lanceolate, reticulate-venulose, thinly but markedly bristly-ciliate; corolla white or pale blue, tubular, 1½ lines long, exceeding the calyx only slightly; scales semi-obovate, quite distinct from scales of contiguous pairs, attenuate below to an extremely slender point adnate to sides of filaments; stamens included; style 2-cleft, very short, included in the fruiting calyx.

Moist soil, 3500 to 5000 feet: Lassen, Shasta and Modoc Cos. North to eastern Oregon. June. It is very similar in aspect and habit to Phacelia ciliata.

Locs.—Bieber, nw. Lassen Co., *J. T. Howell* 12,222; Bald Mt., s. of Fall River Mills, ne. Shasta Co., *Hall & Babcock* 4269; Little Hot Springs Valley, sw. Modoc Co., *M. S. Baker;* Horse Camp, 6 mi. se. of Perez sta., w. Modoc Co., *J. T. Howell* 12,270. So far as the records show this species has no habitat relation to hot springs.

Refs.—PHACELIA THERMALIS Greene, Erythea 3:66 (1895), type loc. Little Hot Springs Valley, Modoc Co., *Baker & Nutting*. *P. ciliata* var. *thermalis* Jepson, Man. 824 (1925).

29. **P. pedicellata** Gray. Stem robust, erect, simple or branched, ½ to 1½ feet high; herbage short-villous and glandular, with a heavy odor; leaf-blades broadly ovate or sub-orbicular in outline, 2½ to 4½ inches long, pinnate with 3 to 7 distinct leaflets; leaflets sub-orbicular to ovate, serrate or incisely lobed, ½ to 2¼ inches long, with petiolules (or the uppermost pair of leaflets with a broadish sessile base); upper leaves sometimes not pinnate but round-ovate and merely deeply toothed (sometimes a basal leaf also simple); flowers closely packed in short racemes, the racemes aggregated in compact terminal cymes; pedicels filiform, 1 to 3 lines long, densely pilose, often deflexed in fruit; calyx-lobes linear or oblanceolate, 2 lines long, exceeding the globular capsule; corolla white, lavender or pale lilac, campanulate, 2 to 2¼ lines long; scales rather broad, free from the filaments, curving upward, each one approximating the scale of the adjacent filament so as to form a sort of hood; stamens and style exserted; style cleft nearly half-way.

Partly shaded cliffs and rocky walls of desert cañons, 300 to 4500 feet, infrequent: Inyo Co.; eastern Mohave Desert; Colorado Desert. East to Arizona, south to Lower California. Mar.-May.

Field note.—A characteristic habitat is as follows: On the steep gradient of a talus slide on the southerly cañon wall of Johnson Cañon, near Shadscale Spr. in the Panamint Range, scattered individuals in a colony of Phacelia pedicellata were flowering on April 22, 1940. The stems, quite erect and unbranched below the inflorescence, bear widely spreading long-petioled leaf-blades, the whole blade rather compact and crumpled or undulate. As seen at a little distance the fleshy petioles, spreading widely from the stout central axis and bearing clumps of vivid green on the end, recall in miniature the wide-spreading branches of conventional illustrations of Lebanon Cedars. The entire herbage is extremely ill-smelling, the stems, petioles and roots very fleshy.

The corolla scales are quite free from but originate near the base of the filaments and are wholly adnate to the corolla-tube. Each scale curves away from the filament; above it is abruptly narrowed to a short lanceolate apex. The curved portion of the scale is quite broad and approximates the curved portion of the scale of the adjoining filament in such a way as to form a hood or sort of chamber. The ovary is seated on a thin white disk (Jepson Field Book, 59:141. ms.).

Locs.—Inyo Co.: Badwater, Death Valley, *C. N. Smith* 103; Johnson Cañon, Panamint Range, *Jepson* 19,637; Shepherd Cañon, Argus Mts., *Jones*. Mohave Desert: Lavic, *Jepson* 15,458; Amboy Crater, *Jepson* 20,308; Fountain Cañon, Providence Mts., *Mary Beal* 550; Piute Creek, near Piute Mts., *N. C. Wilson*. Colorado Desert: Devils Cañon, 8 mi. w. of Coachella, *Clary* 1612; Palm Creek, w. of Borrego Sprs., *T. Brandegee;* Wagon Wash near Sentenac Cañon, below San Felipe Valley, e. San Diego Co., *Jepson* 12,482.

Refs.—PHACELIA PEDICELLATA Gray, Syn. Fl. 2:160 (1878), type from L. Cal., *Streets;* Jepson, Man. 824 (1925).

30. **P. crenulata** Torr. Stem erect, branching, ½ to 1 (sometimes 3) feet high; herbage glandular throughout and ill-scented, hirsutulous to hirsute or hirsute-

hispid with spreading hairs; leaf-blades elliptic-oblong to linear-oblong (or ovate) in outline, 1½ to 3½ inches long, irregularly toothed or lobed or pinnately divided (especially below) into oblong or orbicular serrate divisions, the lower segments or divisions 3 to 7 lines long, sometimes distinct and discrete; petioles mostly short; racemes dense, in terminal clusters; pedicels very short (¼ to 1 line long); calyx-lobes oblong, obtuse, 2 lines long; corolla deep violet or purple-blue with whitish throat, rotate-campanulate, 2 to 5 lines long, the lobes crenulate; scales broad below but narrowed above to an acute tip, wholly adnate, the broad portion of each pair so curved as to receive the filament in a pocket-like structure; stamens and deeply cleft style long-exserted; filaments glabrous.

Sandy-gravelly desert valleys, washes and mesas, 250 to 5700 feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. North to Idaho, east to Colorado and Arizona, south to Lower California. Mar.-May.

Locs.—Inyo Co.: Inyo, *Rixford;* pass betw. Coso Mts. and Inyo Mts., *Jepson* 19,538; Argus Range (n. end), *Jepson* 19,558; Panamint Valley, *Renner* 52; Emigrant Cañon, Death Valley *C. N. Smith* 101; Johnson Cañon, Panamint Range, *Jepson* 19,651. Mohave Desert: Barnwell, New York Mts., *K. Brandegee;* Mitchells Caverns (plain below), Providence Mts., *Jepson* 18,350; Paradise Mts. (6 mi. ne.), *Jepson* 17,252; Poison Cañon, w. of Searles Lake, *Allison Krames;* Mohave Pinnacles, 15 mi. s. of Trona, *C. N. Smith* 78; Barstow, *Jepson* 5360; Ord Mt., *Jepson* 15,493. Colorado Desert: Riverside Mts., e. Riverside Co., *J. Grinnell;* Painted Cañon, Mecca Hills, *Jepson* 11,648; Deep Cañon, Santa Rosa Mts., *Munz* 11,974 (stems very hispid=var. ambigua Mcbr.); Santa Rosa Mts. (foot of, 12 mi. sw. of Indio), *Clary* 1605; Silent Cañon, foothills at se. end of Santa Rosa Mts., *Jepson* 11,694; Bailey Well, e. of Borrego Sprs., *Jepson* 17,084; Vallecito, e. San Diego Co., *Jepson* 8608; Coyote Wells (3 mi. w.), *Newlon* 398.

Var. **funerea** Voss. Stems reddish, both stems and leaves very glandular, herbage staining paper brownish; leaf-blades 1¼ to 6½ inches long, the lower segments often consisting of distinct and discrete divisions or leaflets, the leaflets sessile or petiolulate; racemes paniculate or mostly so, rather than cymose.—Cañon flats or washes, Inyo Co.: White Mts. (Westgard Pass, *Hovannitz*) to Grapevine Mts. (near Klare Spr., Titus Cañon, *Jepson* 19,849) and Death Valley (Emigrant Pass, *C. L. Hitchcock* 12,324).

Var. **minutiflora** (Voss) Jepson comb. n. Corolla yellowish-white, 2 lines long; stamens less conspicuously exserted.—Rocky mesas, 400 to 1000 feet, Colorado Desert: Coyote Wells region; Four-S Pass, e. Imperial Co., *Peirson* 11,465. South to Lower California.

Refs.—PHACELIA CRENULATA Torr.; Wats., Bot. King 251 (1871), type loc. Trinity Mts., Nev., *Watson;* Jepson, Man. 824 (1925). *P. crenulata* var. *vulgaris* Brand; Engler, Pflzr. 4^{251}:78 (1913), based on type of species. *P. ambigua* Jones, Contrib. W. Bot. 12:52 (1908), type loc. Needles, *Jones* 3822; stems rather densely setose-hispid. *P. crenulata* var. *ambigua* Mcbr., Contrib. Gray Herb. 49:25 (1917). Var. FUNEREA Voss; Munz, Man. 409, 600 (1935), type loc. Black Cañon, White Mts., *Duran* 561. Var. MINUTIFLORA Jepson. *P. minutiflora* Voss; Munz, Man. 409 (1935), type loc. Cargo Muchacho Mts., Colorado Desert, *Munz & Hitchcock* 12,141.

31. **P. malvaefolia** Cham. STINGING PHACELIA. Stem erect, freely branching or subsimple, ½ to 2½ feet high; herbage hispid-bristly throughout, the bristles with a conspicuous pustulate base; leaf-blades round-ovate to elliptic-ovate, truncate or cordate at base, shallowly lobed (the lobes serrate), 1 to 4¼ inches long, the petioles ⅕ to ½ as long; racemes solitary or geminate; corolla dull white, 2 to 2½ lines long, longer than the unequal spatulate sepals; scales semi-ovate, the apical point free; stamens exserted; capsule globose, 2 to 4-seeded, ½ to ¾ as long as calyx; seeds pitted, 1 to 1¼ lines long.

Ocean bluffs, hillslopes or sand dunes along or near the coast, 10 to 500 feet: Monterey Co. to Humboldt Co. North to southern Oregon. May-Aug.

Locs.—Big Sur, Monterey Co., *K. Brandegee;* Cypress Pt., Monterey, *Jepson* 9757; Bonnie Doon (2½ mi. w.), Santa Cruz Co., *Yates* 5554; Pilarcitos Lake, San Mateo Co., *Davy* 1139; Lands End, San Francisco, *Davy;* Shellmound, Emeryville, Alameda Co., *Greene;* Sausalito, Marin Co., *Kellogg & Harford* 197; Inverness, Marin Co., *Jepson* 557d; Pt. Arena, Mendocino Co., *Congdon;* Trinidad, Humboldt coast, *Tracy* 8118; Dry Lagoon (near Stone Lagoon), Humboldt coast, *Tracy* 13,212.

Var. **loasaefolia** Brand. Leaf-blades averaging smaller (½ to 2 inches long), the lower shallowly pinnately cleft or sometimes divided, the lowest often with discrete segments or leaflets; capsule 4 to 6-seeded, the seeds ¾ line long.—Santa Lucia Mts., especially along the coast, from San Luis Obispo Co. (Avila, *Summers* 571; Davis Cañon, *Unangst*) to Monterey Co. (Gorda, *K. Brandegee;* Limekiln Creek, Monterey coast, *Jepson* 1675; Pacific Grove, *Heller* 6716). At Monterey it passes into the ordinary form of P. malvaefolia.

Tax. note.—In the seeds of Phacelia malvaefolia the pits are rather large and shallow, the intervening ridges without projecting points. In the seeds of var. loasaefolia the pits are smaller and deeper, the ridges with projecting points. Note, however, Espinosa Cañon, Monterey Co., *Hoover* 4116, the seeds intermediate as to pitting and sometimes 4 in a capsule, sometimes 6, or in some capsules one cell contains 2 large seeds, the other 3 smaller seeds.—R. F. Hoover.

Refs.—PHACELIA MALVAEFOLIA Cham., Linnaea 4:494 (1829), type loc. San Francisco, *Chamisso;* Jepson, Fl. W. Mid. Cal. 438 (1901), ed. 2, 342 (1911), Man. 825 (1925). Var. LOASAEFOLIA Brand; Engler, Pflzr. 4^{251}:94 (1913); Jepson, Man. 825 (1925). *Eutoca loasaefolia* Benth., Trans. Linn. Soc. 17:277 (1837), type from Cal., *Douglas. P. loasaefolia* Torr., Bot. Mex. Bound. 143 (1859).

32. **P. rattanii** Gray. Stem branching from the base, ⅓ to 1½ feet high; herbage thinly but conspicuously spreading-bristly; leaf-blades ovate in outline, truncatish or subcordate at base, thin, ¾ to 2 inches long, shallowly pinnate-lobed, the lobes irregularly serrate; racemes slender, loose or somewhat dense, ½ to 2 inches long, terminal in 1s or 2s on the stems and branches or borne on peduncles in the upper axils; four calyx-lobes spatulate, one obovate and slightly longer; corolla dull-white or bluish-white, funnelform, 2 to 2½ lines long; scales very narrow and very long, wholly adnate, almost equaling the filaments in length; stamens included; filaments hairy; style cleft nearly ½.

Brushy hillslopes, 1000 to 4000 feet: Coast Ranges from Santa Clara Co. to western Siskiyou Co.; Sierra Nevada in Shasta Co. North to southern Oregon. June-July.

Field note.—In aspect and in herbage Phacelia rattanii closely resembles P. malvaefolia. Although not a rare plant it is somewhat obscure and is probably more frequent than collections suggest. The bristly hairs are somewhat stinging.

Locs.—Coast Ranges: East Fork Coyote Creek, Mt. Hamilton Range, *Dudley* 4194; Charmichael Mill, Santa Cruz Mts., Santa Cruz Co., *Pendleton* 940; Kelseyville, Lake Co., *T. Brandegee;* Scotts Valley, Lake Co., *Tracy* 1675; Bartlett Sprs., *Jepson* 18,933; Rice Fork, South Eel River, n. Lake Co., *M. S. Baker* 3084b; South Mill Creek (head of), Ukiah, *Jepson* 9274; White Thorn Valley, sw. Humboldt Co., *Tracy* 6305; Hornbrook, Siskiyou Co., *Curran.* Shasta Co.: Burney Falls, *M. S. Baker* 397.

Refs.—PHACELIA RATTANII Gray, Proc. Am. Acad. 20:302 (1885), type loc. Lake Co., *Rattan* (that is on South Eel River, n. Lake Co., per Rattan's herb. label); Jepson, Fl. W. Mid. Cal. 438 (1901), ed. 2, 342 (1911), Man. 825 (1925). *P. flaccida* Elmer, Bot. Gaz. 41:323 (1906), type loc. Wright's sta., Santa Clara Co., *Elmer* 4404.

33. **P. lyonii** Gray. Stem robust, erect, branching, 1 to 2 feet high; herbage dark glandular-hirsutulose, heavy-scented; leaf-blades large (broadly ovate in outline, 2 to 5 inches long), pinnate with the pinnae pinnately parted or divided into ovate lobes, the lobes crenate, 2 to 4 lines long; racemes dense, 1 to 2½ inches long, compacted into a dense terminal cymose panicle; calyx-lobes linear-spatulate, dorsally concave at the rounded tips or with revolute margins, nearly equaled by the capsule; corolla light blue or whitish, broadly campanulate, 2 to 3 lines long; scales semi-oval, united at base to the filaments; stamens not exserted; capsule narrowly oblong, many-seeded; seeds oval, scrobiculate.

Rocky cañon slopes or flats, 20 to 500 feet: Santa Catalina and San Clemente islands. May-June.

Locs.—Avalon, Santa Catalina Isl., *Hall* 8283; San Clemente Isl., *Murbarger* 226.

Refs.—PHACELIA LYONII Gray, Proc. Am. Acad. 20:303 (1885), type loc. Santa Catalina Isl., *Lyon;* Jepson, Man. 826 (1925).

34. **P. douglasii** Torr. Stems several from the base, mostly simple, ascending or decumbent, 3 to 9 inches long; herbage hirsute with mostly spreading hairs; leaf-blades elongated-oblong or linear in outline, ½ to 2½ inches long, pinnatifid or pinnately parted, the lobes often markedly unequal, often angular, entire or few-toothed, ½ to 1 (or 4) lines long; petioles ½ to 1½ inches long; flowers loosely racemose; pedicels slender, frequently longer than the flowers, curved or retrocurved (at least usually so in age), 1 to 12 lines long; calyx-lobes spatulate, ciliate, 2 to 3

lines long; corolla lilac or pale purple, turbinate-campanulate, 3 to 6 lines long, 4 to 7 lines broad; scales semi-ovate or semi-lanceolate, widest near the middle and wholly adnate; style 2-cleft at apex, hairy below; ovary densely clothed with long straight erect yellowish hairs; ovules 12 to 24 to each dilated placenta; capsule ovate, mucronate; seeds reticulate-foveolate.

Sandy soil of valleys, low hills or coastal dunes, 20 to 2000 (or 4000) feet: Coast Ranges from San Francisco and Contra Costa Cos. to San Luis Obispo Co.; San Joaquin Valley; southern Sierra Nevada foothills from Tulare Co. to Kern Co.; Tehachapi Mts.; cismontane Southern California from Santa Barbara Co. to Santa Catalina Island and the San Gabriel and San Bernardino valleys. Mar.-May.

Field note.—The habit and aspect of this species are suggestive of Nemophila menziesii. The flowers are sometimes showy, sometimes small, a variability frequently characteristic of Phacelia annuals. In general the leaves are rather finely (though often unequally) pinnately lobed or divided, but sometimes, as in the inner Coast Range, they are very large and merely coarsely toothed (Alcalde, sw. Fresno Co., *T. Brandegee*).

Locs.—South Coast Ranges: Lake Merced, San Francisco Co., *Michener & Bioletti;* Castroville, n. Monterey Co., *K. Brandegee;* Seaside sta., Monterey Bay, *Heller* 6566; Mission Soledad, Salinas Valley, *Jepson* 8434; North Fork Lewis Creek (n. of Priest Valley), se. Monterey Co., *Jepson* 2677; Cholame, San Luis Obispo Co., *Jepson* 16,188; Paso Robles, *Barber;* Arroyo Grande, San Luis Obispo Co., *Alice King;* Cuyama Valley, se. San Luis Obispo Co., *Ferris* 9136; Midoil (2 mi. sw.), Temblor Range, *Johannsen*. San Joaquin Valley: Oakley, ne. Contra Costa Co.; Chowchilla (8 mi. w.), Madera Co., *Hoover* 526; Huron, Fresno Co., *T. Brandegee;* Tulare, *Davy* 3104; Porterville, Tulare Co., *L. Donnely;* Bakersfield, *Davy* 1743. Sierra Nevada foothills in Tulare and Kern Cos.: Success, South Fork Tule River, *Keck & Clausen* 3202; Poso Creek, Greenhorn Mts., *C. N. Smith* 297; Cottonwood Creek, ne. of Bakersfield, *Allison Krames*. Tehachapi Mts.: Caliente, *K. Brandegee;* Tejon Hills, *Keck & Clausen* 3178. Cismontane S. Cal.: Santa Maria, n. Santa Barbara Co., *Jepson* 19,099; Elizabeth Lake, n. Los Angeles Co., *Hall* 3063; Santa Catalina Isl., *K. Brandegee;* Playa del Rey near Los Angeles; San Bernardino, *Lemmon;* Wineville, near Riverside, *Munz & Harwood* 3834. On account of the broad calyx-lobes and small corollas the last four stations represent intergrades to var. cryptantha.

Var. **petrophila** Jepson. Leaf-blades entire or some with 1, rarely 2, coarse teeth on each side below the middle; corolla scales almost obsolete.—Corral Hollow, Mt. Hamilton Range.

Var. **cryptantha** Brand. Stems diffuse or spreading, leafless or nearly so (the leaves all or mostly basal), bearing flowers from near the base or above the middle, the flowers distant; pedicels short, ½ to 1 (or 3) lines long; calyx-lobes broadly spatulate, inclined to curve outward; corolla small, equaling the calyx or little exceeding it (1 to 1¼ times as long).—Cismontane Southern California: Los Angeles coast (Redondo, *Geis*) to the San Bernardino Valley (Riverside, *C. M. Wilder* 873) and western San Diego Co. (San Diego River, *Cleveland*). South to Lower California.

Refs.—PHACELIA DOUGLASII Torr., Bot. Mex. Bound. 143 (1859); Jepson, Fl. W. Mid. Cal. 436 (1901), ed. 2, 340 (1911), Man. 826, excluding fig. 793 (1925). *Eutoca douglasii* Benth., Trans. Linn. Soc. 17:276 (1835), type from Cal., *Douglas*. *P. douglasii* f. *modesta* Brand; Engler, Pflzr. 4^{251}:114 (1913), type loc. North Fork Lewis Creek, se. Monterey Co., *Jepson* 2677 (a small-flowered form, more common southward). Var. PETROPHILA Jepson, Man. 826 (1925), type loc. Corral Hollow, w. San Joaquin Co., Mt. Hamilton Range, *Jepson* 9583. Var. CRYPTANTHA Brand, l.c., type loc. San Diego, *Jones* 3085; Jepson, Man. 826 (1925). *P. palmeri* Vasey & Rose, Proc. U. S. Nat. Mus. 11:532 (1888), type loc. San Quentin, L. Cal., *Palmer;* not P. palmeri Wats. (1871). *P. stellaris* Brand, l.c. 123, a new name for *P. palmeri* Vasey & Rose.

35. **P. curvipes** Torr. Stems few to many from the base, diffuse or ascending, 1½ to 5 (or 7) inches high; herbage pubescent; leaf-blades oblong-obovate to oblong, oblong-oblanceolate or linear, mainly entire (or sometimes a few basal coarsely and incisely few-toothed), ¼ to ¾ (or 1½) inches long, the petioles ½ to as long; racemes simple, rather lax; pedicels 1 to 2 lines long, curved or retrocurved in age; corolla blue (sometimes lavender or white), campanulate, 2 to 3 or 5 lines long, shorter than or exceeding (sometimes twice as long as) the linear or (in fruit) ligulate-spatulate calyx-lobes; corolla-scales narrow, wholly adnate, truncatish at apex, joined in pairs at base of filament and diverging upward; stamens half as long as the corolla, a little hairy; ovary densely hairy with erect hairs; style cleft ½ to ¾, a little hairy below; capsule ovate, acuminate, erect upon the spreading or deflexed pedicel; seeds 6 to 16, areolate with a deep pit in center of each areola.

Gravelly slopes of mountains in or bordering the deserts, often under pines, 4000 to 8000 feet: mountains on the west side of the Colorado Desert; Mohave Desert and the mountains bordering its westerly sides; Tehachapi Mts.; southern Sierra Nevada in Kern Co.; Inyo Co. North to Nevada, east to Utah. May-June.

Locs.—Mts. on west side of the Colorado Desert: Laguna Mts., *T. Brandegee;* Volcan Mts., *T. Brandegee;* Palomar Mt. (east side, Oak Grove trail), *Munz* 10,399; Vandeventer Flat, Santa Rosa Mts., *Jepson* 1421. Mountains bordering the westerly sides of the Mohave Desert: Mill Creek, San Bernardino Mts., *Jepson* 5577; Bear Valley, San Bernardino Mts., *Parish* 3770; Cajon Pass, *Peirson* 2431; Lytle Creek Cañon, San Gabriel Mts., *Hall;* Bear Cañon, Mt. San Antonio, *T. Craig* 404; Mt. Wilson, San Gabriel Mts., *Geo. B. Grant;* Frazier Mt., n. Ventura Co., *Dudley & Lamb* 4571. Mohave Desert: Antelope Valley, *A. Davidson;* Ord Mt., *Jepson* 5886. Tehachapi Mts.: Caliente, *K. Brandegee.* Southern Sierra Nevada in Kern Co.: Erskine Creek, *Purpus* 5049; Greenhorn Pass, Greenhorn Mts., *Purpus* 5698. Inyo Co.: Lone Pine Creek, *Hall & Chandler* 7200; Independence Creek, *Hall & Chandler* 7301; Andrews Camp, *K. Brondegee.*

The typical form with small corollas passes by intergrades into a larger flowered form (var. davidsonii Brand) which is not otherwise different: Piute Mts., Kern Co., *C. N. Smith* 163; Mt. Wilson, San Gabriel Mts., *Peirson* 968; Swartout Cañon, San Gabriel Mts., *Hall;* Oak Glen, San Bernardino Mts., *R. J. Smith* 7; Laguna Lakes, Laguna Mts. Plants with small corollas and plants with large corollas may often be found in the same locality. In a colony a few yards square on Bear Mt., Tehachapi Mts. (*Jepson* 7175), depauperate plants bear small corollas, robust plants larger corollas. The var. INSULARIS (Munz) Jepson comb. n. occurs on Santa Rosa and San Miguel islands; its corolla scales are half-free and the filaments glandular-puberulent (ex char.).

Refs.—PHACELIA CURVIPES Torr.; Wats., Bot. King 252 (1871), "foothills near Carson and Washoe cities and on the Trinity Mts., w. Nev.," the type *Watson* 877; Jepson, Man. 827 (1925). *P. davidsonii* Gray, Proc. Am. Acad. 10:324 (1875), type loc. Kern Co., *Geo. Davidson;* Jepson, l.c. (1925). *P. curvipes* var. *davidsonii* Brand; Engler, Pflzr. 4^{251}:115 (1913). *P. davidsonii* var. *macrantha* Parish, Erythea 6:90 (1898), type loc. Waterman Cañon, San Bernardino Mts., *Parish;* Jepson, l.c. *P. curvipes* f. *macrantha* Brand, l.c. 116. *P. aldersonii* Greene, Pitt. 5:22 (1902), type loc. Witch Creek, San Diego Co., *Alderson.* *P. nemophiloides* Greene, l.c. 5:23, type loc. San Bernardino Mts., *Parish.* *P. pratensis* Hel., Muhl. 2:236 (1906), type loc. McGee Mdws., Birch Creek, foothills w. of Bishop, Inyo Co., *Heller* 8273. *P. curvipes* var. *pratensis* Brand, Univ. Cal. Publ. Bot. 4:222 (1912). Var. INSULARIS Jepson. *P. insularis* Munz in Hoffman, Bull. S. Cal. Acad. 31:113 (1932), type loc. Santa Rosa Isl., *Munz* 11,756.

36. **P. rotundifolia** Torr. Stem commonly much-branched from base, 3 to 8 inches high; herbage hispidulous, dark glandular, usually reddish-brown; leaf-blades cordate-orbicular or cordate-ovate, coarsely crenate, 3 to 8 lines long, on petioles 1 to 2½ times as long; racemes short, lax, rather few-flowered; pedicels in fruit ½ to 3 lines long; calyx-lobes spatulate to linear-spatulate, exceeding the mature capsule; corolla white, tubular, 1½ to 2½ lines long, 1¼ to 1½ times as long as the calyx, its lobes transversely quadratish or suborbicular; scales reduced to very narrow wings or linear thickenings or obsolete; stamens included; style slightly bifid at the apex; ovules 20 to 30 to each placenta; seeds globular.

Shaded rock pockets or crevices of cliffs in desert cañons or in sandy-gravelly washes, 2000 to 4500 feet: Inyo Co.; eastern Mohave Desert. East to Utah and Arizona. Apr.-May. Infrequent.

Locs.—Inyo Co.: Inyo, *T. Brandegee;* Titus Cañon, Grapevine Mts., *Jepson* 19,850; Johnson Cañon, Panamint Range, *Jepson* 19,599. Mohave Desert: Kane Spr., Ord Mts., *Hall & Chandler* 6811; Mitchells Caverns, Providence Mts., *Jepson* 18,176; Piute Creek, near Piute Range, *N. C. Wilson.*

Refs.—PHACELIA ROTUNDIFOLIA Torr.; Wats., Bot. King 253 (1871), type loc. s. Utah, *Palmer;* Brand in Engler, Pflzr. 4^{251}:121, fig. 21 (1913); Jepson, Man. 827 (1925).

37. **P. mustelina** Cov. Stem somewhat stout, freely and widely branched, 3 to 9 inches high; herbage densely glandular-villous, as also the racemes and calyces; leaf-blades suborbicular to broadly ovate, truncatish to subcordate at base, dentately few-toothed, the petioles ¼ to ¾ as long; racemes moderately dense, the pedicels short (¼ to 1 line long); calyx-lobes spatulate; corolla purple or pink with whitish throat, tubular-campanulate, 4 to 6 lines long, its scales linear or slightly widened upward, wholly adnate, at apex truncate, at base joined to base of filaments; stamens inserted at summit of proper tube, a little shorter than corolla,

glabrous or essentially so; style cleft only at apex, hispid on lower half; fruiting calyces rather closely erect; capsule 26 to 40-seeded, the seeds areolate with a pit in center of the areolae.

Rocky ledges in arid cañons, 4500 to 7000 feet: Grapevine and Black mountains and Panamint Range bordering Death Valley, Inyo Co. June-Nov.

Geog. note.—Phacelia mustelina, a narrow endemic, has been collected in the Grapevine Mts. (near Klare Spr., Titus Cañon, *Jepson* 19,848) and in Wildrose Cañon (*Gilman* 1983), and Wood Cañon (Jour. Wash. Acad. Sci. 27:197) and on Tin Mt., *Gilman* 3877, of the Panamint Range; also in Dantes Cañon, Black Mts., *Gilman* 3500. It is closely related to Phacelia pulchella Gray (Proc. Am. Acad. 10:326,—1875) of southern Utah and southern Nevada. Both species are insufficiently known. Phacelia mustelina is here recognized by reason of its short pedicels (the pedicels in P. pulchella are nearly as long as the calyx), its erect fruiting calyces (the calyces in P. pulchella are spreading), its stamens inserted at summit of proper tube (in P. pulchella inserted at base of tube), and its corolla-scales (beginning at summit of proper tube) truncatish at apex (tapering to apex in P. pulchella). The fruiting calyces are cylindric in Phacelia mustelina, in P. pulchella they tend to be turbinate. In addition, the herbage in Phacelia mustelina is much more glandular than in P. pulchella. Such indicated differences may be modified when these plants are better known geographically.

Ref.—PHACELIA MUSTELINA Cov., Proc. Wash. Acad. Sci. 27:196 (1937), type loc. Titus Cañon, Grapevine Mts., Inyo Co., *Gilman* 1810.

38. **P. divaricata** Gray. Stem branched from the base, diffuse or spreading, 2 to 12 inches high, the branches both hirsute and pubescent, 3 to 16 inches long; leaf-blades broadly oblong to ovate, strigose, entire, rarely with a pair of coarse teeth towards base, or with a pair of supplementary lobes at summit of the petiole (½ or) 1 to 2 inches long; petioles of basal leaves equaling or exceeding the blade, those of the cauline very short (1 to 6 lines long); pedicels ½ to 1 line long; calyx-lobes in fruit linear or oblanceolate, 4 to 7 lines long, sparsely hispid-ciliate, with somewhat thickened margins and prominent midnerve and cross-veins; corolla blue, broadly open-campanulate, sometimes with 5 brown spots at base of throat, 5 to 9 lines broad; scales rather broad, undulately narrowed upward to an acute point, wholly adnate; style 2-cleft at apex; seeds 7 to 10, regularly pitted.

Open hills, often on grassy slopes, 200 to 2000 feet: Coast Ranges from Colusa and Marin Cos. to San Benito Co. Mar.-June.

Locs.—Wilbur Sprs. (3½ mi. se., on Bear Creek), sw. Colusa Co., *W. I. Follett;* Calistoga (e. of, on Pope Valley grade), *Jepson* 21,020; Mt. Tamalpais, *A. L. Grant;* Oakland Hills, *A. L. Grant;* Las Trampas Ridge, Contra Costa Co., *Jepson* 21,019; Mt. Diablo, *Bowerman* 2897; Redwood City, *Jepson* 5733; Mt. Hamilton, *Chandler* 6040; Los Gatos (hills w.), *Pendleton* 555; New Idria, San Carlos Range, se. San Benito Co., *Eastwood;* North Fork Lewis Creek (n. of Priest Valley), se. Monterey Co., *Jepson* 2679a.

Var. **wrangeliana** (F. & M.) Jepson comb. n. Stems several from the base, decumbent or diffuse, 2 to 7 inches long, these and the petioles spreading-hirsute; leaf-blades strigose, ½ to 3 inches long, of two main patterns but with intergrades: (a) leaf-blades ovate to oblong in outline, pinnately sinuate-divided, the lobes entire or once-cleft or -toothed, obtuse, usually with some smaller lobes between; (b) leaf-blades ovate to oblong, entire, or with 1 or 2 pairs of supplementary lobes at summit of petiole; racemes few-flowered, dense; pedicels ¼ to 1 line long; calyx-lobes nearly as long as the corolla in anthesis, becoming much enlarged in fruit, oblong to obovate, 4 to 6 lines long, the lower calyx-lobe usually conspicuously larger than the rest; corolla blue, broadly campanulate, 3 to 4 lines long, the tube dull white; scales narrow, adnate ¼ to ½ their length to the filament, the upper slender-lanceolate portion wholly free, the scale free from corolla except at base; stamens ¾ as long as corolla; ovary densely white-hairy; ovules 16 to 24; style cleft ½, about ½ as long as corolla; capsule markedly compressed.—Ocean shore-line, 20 to 50 feet, within 10 to 400 yards of the beach: Marin Co. (Pt. Reyes, *Ferris* 8043) to Mendocino Co. (near Fort Bragg, *Seaholm*). Mar.-May.

Note on flower and habit of var. wrangeliana.—The corolla-lobes are transversely elliptic with the lower corners rounded and overlapping those of the adjacent lobes in such a way as to make these corners appear as if auriculate. One corolla-lobe is markedly hairy on the back, the others obscurely hairy. Just below each corolla sinus is a shallow saccate areola or depression, oblong in shape. Collections from the colony at Fort Bragg are markedly diverse in aspect and leafage and somewhat in habit. Plants growing in grass are very slender. Var. wrangeliana has, perhaps, some claims to specific status.

Refs.—PHACELIA DIVARICATA Gray, Proc. Am. Acad. 10:325 (1875); Jepson, Fl. W. Mid. Cal. 437 (1901), ed. 2, 340 (1911), Man. 828 (1925). *Eutoca divaricata* Benth., Trans. Linn. Soc.

17:278 (1837), type from Cal., *Douglas*. Var. WRANGELIANA Jepson. *Eutoca wrangeliana* F. & M., Ind. Sem. Hort. Petrop. 2:37 (1835), type loc. Fort Ross, Sonoma Co.; Erythea 2:148 (1894). *E. divaricata* b *wrangeliana* A. DC., Prodr. 9:293 (1845).

39. **P. congdonii** Greene. Stem erect and simple or more often divergently branched, 2½ to 9 inches high, sparingly leafy, hirsutulous; leaves basal or subbasal; leaf-blades obovate or narrowly elliptic to oblong, ½ to 1 inch long, entire, strigose, the lower long-petioled, the upper nearly sessile; racemes soon a little loose; calyx-lobes linear to narrowly spatulate, puberulent and also hirsute-ciliate; corolla light blue, campanulate, slightly puberulent outside, 3 to 3½ lines long, its scales adnate, very short and broad at base (where attached in pairs to the filament and thus forming a large pocket), abruptly reduced and narrow at apex; stamens included, the filaments glabrous or with scattered very short hairs; style usually cleft ⅓, glabrous or scantily hairy below; capsule about 6-seeded.

Sandy soil around bushes, 2000 to 5000 feet, infrequent: Sierra Nevada from Mariposa Co. to Kern Co. Apr.-May.

Note on relationship.—"In general aspect Phacelia congdonii simulates P. humilis to such a degree that it has been regarded as a variety of that species. This plant of the chaparral belt in the foothills of the southern Sierra Nevada, however, may well be distinguished from Phacelia humilis, a species which has its development in the Canadian Zone on the east side of that mountain range. Morphologically, P. congdonii appears to be closest to P. curvipes. It is most readily separated from that species by its short straight fruiting pedicels, light blue corolla, very short (if any) hairs on the filaments, and the different form of the corolla-scales."—R. F. Hoover.

Discovered over four decades ago, Phacelia congdonii is still so little collected that much remains to be done in determining its full status. The following stations indicate its range: Buckeye, Mariposa Co.; Big Sandy Valley, e. base of Black Mt., Fresno Co., *Hoover* 3466; Stony Flat, near Cedarbrook, Fresno Co., *Hoover* 4360; Greenhorn Pass, Kern Co., *Purpus* 5698.

Refs.—PHACELIA CONGDONII Greene, Pitt. 5:22 (1902), type loc. Buckeye, Mariposa Co., *Congdon*. *P. humilis* var. *congdonii* Mcbr., Contrib. Gray Herb. 49:38 (1917).

40. **P. keckii** M. & J. Stem diffusely branching from the base, reddish-brown, 5 to 16 inches high; herbage puberulent and thinly hirsute, slightly glandular; leaf-blades oblong, mostly tapering at base, entire or with a pair of salient lobes towards the base, ¾ to 1¾ inches long, the petioles nearly as long or the upper ones 1 to 2 lines long; racemes dense, terminal on the branches, 2 to 3 inches long; calyx-lobes oblong-oblanceolate, long-hirsute (especially on the margins); corolla violet (the throat and tube white), turbinate-campanulate, 3½ to 4 lines long, only slightly exceeding the calyx, its limb 3 to 5 lines wide; stamens glabrous, included.

Dry ridges, 3500 to 5000 feet: Santa Ana Mts. June.

Ref.—PHACELIA KECKII M. & J., Bull. Torr. Club 51:298 (1924), type loc. trail from Glen Ivy to Santiago Peak, Santa Ana Mts., *Munz* 7056. The corolla limb (*Munz & Keck* 7068) is 4 to 5 lines wide; in P. suaveolens, a near relative, 2 to 2½ lines wide.

41. **P. saxicola** Gray. Plant compactly branched from the base, 1 to 2 inches high, the branches flowering from the base or below the middle; herbage, inflorescence and calyces minutely glandular-puberulent and hispidulous with spreading hairs; leaf-blades obovate, entire, 1 to 2½ lines long, drawn down to a petiole ½ to as long; racemes only slightly scorpioid, the flowers discrete, the pedicels short, subequal; calyx-lobes linear-spatulate, nearly as long as the corolla-throat; corolla purplish-limbed, tubular, ¾ to 1¼ lines long, the rounded lobes ascending, ½ line long; scales very narrow or none; stamens ¾ as long as corolla-tube and -throat, the filaments a little dilated downward; style short, cleft ⅓; capsule about half as long as the fruiting calyx, about 50-seeded.

Gravelly hillslopes, 6200 feet: southern Mono Co. East to southern Nevada and northwestern Arizona. Apr.-July.

Loc.—Sherwin Hill, *Peirson* 12,148.

Ref.—PHACELIA SAXICOLA Gray, Proc. Am. Acad. 20:304 (1885), type loc. Kingman, n. Ariz., *Lemmon*.

42. **P. suaveolens** Greene. Stem branched from the base, erect or ascending, 7 to 12 inches high; herbage glandular-pubescent; leaf-blades obovate to oblong-

elliptic, coarsely toothed (the teeth entire or sparsely denticulate), 1 to 2 inches long, on petioles ½ to ¾ as long; racemes solitary or in pairs, densely flowered, becoming 1 to 2 (or 5) inches long; pedicels very short (¼ to ⅓ line long); calyx-lobes obovate-spatulate to oblanceolate, hirsutulous, much longer than the ovate capsule; corolla light blue with yellow tube, cylindric or cylindric-campanulate, sparingly puberulent outside, 4 lines long, nearly twice as long as calyx, its limb 2 to 2½ lines wide; scales linear, or very narrow, adnate; stamens included; style shortly bifid at apex; ovules 6 to each placenta.

Mountain slopes, usually on burns, 200 to 2500 feet: Coast Ranges from Lake Co. to western Solano Co., Marin Co. and Mt. Diablo; Sierra Nevada foothills in Amador Co. Apr.-June.

Locs.—Coast Ranges: Mt. Konocti, Lake Co., *Carter* 354; Vaca Mts., w. Solano Co., *Platt;* Mt. Tamalpais, Marin Co., *Jepson* 21,030; Black Hills, Mt. Diablo, *Bowerman* 2078. Amador Co.: Ione, *Hoover* 2419.

Refs.—PHACELIA SUAVEOLENS Greene, Pitt. 1:223 (1888), type loc. Petrified Forest, Sonoma Co., *Greene;* Jepson, Fl. W. Mid. Cal. 437 (1901), Man. 828 (1925); Brand in Engler, Pflzr. 4^{251}: 113, fig. 19 (1913). *P. brachyloba* Jepson, Fl. W. Mid. Cal. ed. 2, 341 (1911), in part.

43. **P. parishii** Gray. Stems few to several from base, diffuse, 2 to 6 inches high, somewhat scape-like, the leaves mostly basal or subbasal; herbage viscid-puberulent; leaf-blades roundish-ovate, crenulate or entire, 6 to 9 lines long, the petioles 2 to 6 lines long; peduncles naked or sometimes sparingly leafy, bearing terminally 1 or 2 spike-like racemes, the peduncles as long or mostly longer than the racemes; racemes short (½ to 1 inch long), the flowers crowded, the pedicels very short; calyx-lobes spatulate, in fruit equaling the oblong capsule; corolla blue or bluish, cylindric, 2 lines long, somewhat exceeding the calyx; scales obscure or none; stamens not exserted; style bifid at apex; capsules spreading; seeds narrowly oblong, scrobiculate, ¾ line long.

Dry alkaline desert flats, 2800 to 3500 feet: southern Mohave Desert. East to Nevada. May-June.

Note on range.—In California, Phacelia parishii is known only from desert playas at Rabbit Springs in the southern Mohave Desert. Only one other station, Steptoe Valley in White Pine Co., Nev., is known. It was collected there by M. E. Jones in 1891. It is thus, as to our knowledge, the rarest of Californian Phaceliae.

Refs.—PHACELIA PARISHII Gray, Proc. Am. Acad. 19:88 (1883), type loc. Rabbit Sprs., Mohave Desert, *S. B. & W. F. Parish;* Jepson, Man. 828 (1925).

44. **P. lemmonii** Gray. Stem more or less branched, 3 to 10 inches high, the branches erect; herbage minutely glandular-puberulent; leaf-blades roundish-ovate to elliptic-ovate, thickish, angular-dentate or crenate, ½ to 1 inch long, the petioles 3 to 8 lines long; racemes rather short-peduncled, rather loose in fruit; calyx-lobes spatulate to linear-spatulate, in fruit a little longer than the ovoid capsule; corolla white, narrow-campanulate, 2 to 3 lines long, 1¼ to 1½ times as long as the calyx; scales long and narrow, wholly adnate; stamens included; style very shortly bifid at summit; capsules closely erect, their pedicels short, ¼ to ½ (or 1½) lines long; seeds about 30, short-oval, ⅓ line long, minutely scrobiculate.

Gravelly slopes of cañons in desert ranges or in ranges bordering the deserts, usually about cienagas or seepages, 3000 to 5000 feet: Santa Rosa Mts.; north slope San Gabriel and San Bernardino mountains; Mohave Desert; Inyo Co. ranges. East to Arizona. May-July.

Locs.—Pinyon Flat, Santa Rosa Mts., *Munz* 15,101; San Bernardino Mts. (n. slope), *Parish* 3792; Rock Creek, San Gabriel Mts. (n. slope), *Parish* 1980; Willow Springs Cañon, Old Dad Mts., *Jepson* 20,445; Argus Range, Inyo Co., *Purpus* 5445; Cottonwood Cañon, Death Valley, *Gilman,* 4302.

Refs.—PHACELIA LEMMONII Gray, Syn. Fl. ed. 2, 2:417 (1886), type loc. Mineral Park, nw. Ariz., *Lemmon* 3350. *P. heterosperma* Parish, Bot. Gaz. 13:37 (1888), type loc. Rock Creek, n. slope San Gabriel Mts., Los Angeles Co., *Parish. P. polysperma* Brand; Engler, Pflzr. 4^{251}:119 (1913), type loc. Rock Creek, n. slope San Gabriel Mts., *Abrams & McGregor* 560.

45. **P. phacelioides** Brand. Stem diffusely branching from the base, 5 to 9 inches high, puberulent and hispid; leaf-blades elliptic to oblong-lanceolate, parallel-veined, entire, strigose, 1 to 1¾ inches long; petioles ¼ to 1 inch long; racemes dense, the fruiting pedicels ½ to 1 line long; calyx-lobes in fruit linear, bristly-hirsute, 5 to 6 lines long, twice or thrice the length of the capsule; corolla dull white, narrowly funnelform, 2½ to 3 lines long; capsule ovate, acute or mucronate, 6 to 16-seeded; seeds scrobiculate.

Mountain peaks, 2300 to 3300 feet, rare: inner South Coast Range from Mt. Diablo to the Mt. Hamilton Range. May-June.

Geog. note.—Localities for Phacelia phacelioides, a restricted endemic, are known only on the higher peaks of the inner South Coast Range, as follows: Mt. Diablo; Sugarloaf Mt., Santa Clara Co.; Red Mt., Santa Clara Co.; Mt. Hamilton. The known localities are few and occurrence is rare in individuals. About 55 miles covers the extent of the longitudinal range. The geographic distribution of this species as thus established affords additional evidence that David Douglas, the original discoverer, must have penetrated, in or about 1831, as far eastward as the inner South Coast Range. It is highly improbable that, as suggested by Gray (Proc. Am. Acad. 10:325), Phacelia phacelioides was obtained in the vicinity of Monterey.

Refs.—PHACELIA PHACELIOIDES Brand; Engler, Pflzr. 4^{251}:117 (1913); Jepson, Man. 828 (1925). *Eutoca phacelioides* Benth., Trans. Linn. Soc. 17:279 (1837), type from Cal., *Douglas*. *Phacelia circinatiformis* Gray, Proc. Am. Acad. 10:325 (1875), based on the preceding; Jepson, Fl. W. Mid. Cal. 436 (1901), ed. 2, 340 (1911).

46. **P. grisea** Gray. Stem diffusely branched, ½ to 1½ feet high; herbage spreading bristly-hirsute and puberulent, somewhat viscid; leaf-blades ovate to oblong, entire or 1 or 2-toothed or incised, 1 to 2½ inches long, tapering to a short (1 to 7 lines) petiole; racemes densely flowered, at length 2 to 4 inches long; calyx-lobes spatulate-obovate, bristly-ciliate, little exceeding the capsule; corolla turbinate-campanulate, nearly white, 4 lines long; scales oblong, adnate, truncate at apex, adnate at base to filaments, the free edge connivent with free edge of scale of adjoining pair; stamens and 2-cleft style conspicuously exserted; capsule shortly beaked; seeds 5 to 11, punctate-reticulate.

Wooded hillslopes, 500 to 3500 feet: along the coast line, Santa Lucia Mts. June-July.

Locs.—Pt. Sur, Monterey Co., *T. Brandegee;* Pine Mt., near San Simeon Bay, San Luis Obispo Co.

Refs.—PHACELIA GRISEA Gray, Proc. Am. Acad. 12:80 (1876), type loc. Pine Mt., back of San Simeon Bay, *Palmer* 381; Jepson, Man. 828 (1925).

47. **P. purpusii** Bdg. Stem erect, simple or branched above, 6 to 14 inches high; herbage hirsute and puberulent, the stems and inflorescence glandular; leaf-blades ovate or oblong-lanceolate, entire (rarely coarsely toothed), ¾ to 2 inches long, the petioles 1 to 8 lines long; racemes peduncled, racemosely disposed along the stems and branches and terminal, densely many-flowered, at length 1 to 5 inches long; calyx-lobes unequal, 2 broadly, 3 narrowly spatulate, exceeding the mature capsule; corolla pale or sordid blue, open-campanulate, 3 to 4 lines long, the tube with lucid spots alternate with the scales; scales narrow or semi-oblong, one from each contiguous pair connivent by their free margins from top to bottom; stamens exserted; style parted below the middle; ovules 2 to 4 to each placenta; seeds foveolate.

Montane gravelly or sandy slopes, 4000 to 6800 feet: Sierra Nevada from Modoc Co. to Kern Co. June-July.

Locs.—Goose Lake (hills e.), Modoc Co., *R. M. Austin;* Stalkers, ne. Shasta Co., *M. S. Baker* 333; Little Summit, Butte Co., *Heller* 11,486; Yosemite, *Bolander* 6384; Sherlocks, Mariposa Co., *Congdon;* betw. Colony Mill and Marble Fork Kaweah River, *Jepson* 661; Guernsey Mill, near Portuguese Mdw., s. Tulare Co., *C. N. Smith* 14; near Summit Camp, Greenhorn Mts., Kern Co., *Peirson* 10,702.

Refs.—PHACELIA PURPUSII T. Bdg., Bot. Gaz. 27:451 (1899), type loc. "Sequoia Mills" (now Millwood, s. Fresno Co.), *T. Brandegee;* Jepson, Man. 828 (1925). *P. humilis* var. *calycosa* Brand; Engler, Pflzr. 4^{251}:103 (1913), as to all spms. directly cited by Brand; probably not P. humilis var. calycosa Gray.

48. **P. vallicola** Congdon. Stem simple or strictly branching, 6 to 12 inches high, puberulent and hispid, somewhat glandular; leaf-blades ovate or oblong-elliptic, entire, strigose, prominently nerved, ¾ to 1¼ inches long, on petioles ½ to nearly as long; racemes with the flowers a little discrete, becoming 2½ to 3½ inches long; fruiting pedicels ascending, ½ to 1 line long; calyx-lobes spatulate or narrowly obovate, exceeding the mature capsule; corolla lavender, tubular-campanulate, 2 to 2¼ lines long, slightly longer than the calyx; scales narrowly linear; stamens not exserted; style short, parted a little below the middle; ovules 12 to 15 in each cell; capsule globose-ovate, shortly subulate-beaked; seeds angular-oblong, reticulate.

Rocky outcrops on ridges and in mountain valleys, 1500 to 5300 feet: Sierra Nevada from Tuolumne Co. to Mariposa Co. May.

Locs.—Long Barn, Tuolumne Co., *Hoover* 4398; Sugarpine Creek (head of), above Yosemite, *Bioletti;* Hennessey Ranch, Mariposa Co., *Lembert.*

Refs.—PHACELIA VALLICOLA Congdon; Brand, Beitr. Hydroph. 7 (1911), type loc. Hites Cove, Mariposa Co., *Congdon;* Jepson, Man. 829 (1925). *P. curvipes* Torr. var. *yosemitana* Brand, Univ. Cal. Publ. Bot. 4:222 (1912), type loc. Tenaya Trail, Yosemite, *Hall* 8951.

49. **P. mohavensis** Gray. Stems slender, erect and usually strictly branched or diffuse with many branches from the base, 2 to 7 (or 10) inches high; herbage hispid and somewhat glandular-puberulent; leaf-blades oblanceolate to linear, entire or with 1 or 2 salient teeth or lobes on each side, ½ to 1½ inches long, narrowed at base to a petiole 2 to 6 lines long; racemes strict, at length 1 to 2 inches long, the short pedicels erect; calyx-lobes spatulate or linear-spatulate; corolla light blue or pale purple with whitish center, campanulate, 2 to 2½ lines long; scales narrow (semi-lanceolate), adnate, widely divergent from base of filament; stamens conspicuously exserted to included, the filaments mostly glabrous; style cleft about ⅔; capsule globose, about ½ length of calyx; seeds 4 to 8.

Dry montane ridges or cañon sides, or moist flats or stream beds, 4000 to 7500 feet: southern Sierra Nevada in Tulare and Kern Cos.; San Gabriel and San Bernardino mountains on their desert slopes or northerly summits. May-June.

Locs.—Southern Sierra Nevada: Trout Mdws., Little Kern River, Tulare Co., *Jepson* 4908 (det. R. F. Hoover); Piute Peak, Kern Co., *Purpus* 5303. San Gabriel Mts.: betw. Pine Flats and Chilao, *Peirson* 962; Big Pines (1 mi. w.), near Mescal Creek, *Peirson* 3164; Icehouse Cañon, San Antonio Mts., *Parish* 11,949. San Bernardino Mts.: Little Bear Valley, *Hall* 1003; Seeley's Flat, *Parish* 2429; Bear Valley, *Parish* 3772.

Refs.—PHACELIA MOHAVENSIS Gray, Syn. Fl. 2:164 (1878), type loc. "se. Cal., on the Mohave River" (that is, on the Mohave headwaters, n. slope of the San Bernardino Mts.), *Palmer;* Jepson, Man. 827 (1925). *P. mohavensis* var. *exilis* Gray, l.c. 165, type loc. Bear Valley, San Bernardino Mts., *Parry & Lemmon.*

50. **P. linearis** Holz. Stems rigid, simple or racemosely or bushy-branched, blue-glaucous, ½ to 1 or 1½ feet high; herbage puberulent and (usually) spreading-hispid also; leaf-blades linear or linear-lanceolate, entire, rarely 2-toothed, or sometimes a few of them deeply 3 or 5-cleft into linear entire lobes, ½ to 2½ inches long, mostly sessile; racemes spike-like, disposed in a virgate or thyrsoid leafy panicle (sometimes from base to summit of plant); calyx-lobes narrowly linear or spatulate-linear, bristly-hirsute, exceeding the capsule; corolla violet or sometimes white, open-campanulate, 3 to 5½ lines long; scales long and narrow, free at the acute apex, free from the filaments; stamens little or not at all exserted, the filaments sparsely hairy near the middle; style cleft about ⅓; capsule shortly beaked; ovules 12 to 16; seeds oblong, coarsely reticulate.

Dry gravelly slopes or flats in the mountains, often abundant in sagebrush, 2000 to 4500 feet: northern Sierra Nevada (mostly transmontane) from Alpine Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges from Trinity Co. to western Siskiyou Co. East to Utah, north to Montana and British Columbia. June-Aug.

Locs.—Sierra Nevada: Alpine Co. (Engler, Pflzr. 4^{251}:110); Sierra Valley, e. Sierra Co., *S. B. Doten* 36; Chat, Honey Lake Valley, *Davy;* Great Spr., Hat Creek, e. Shasta Co., *Hall &*

Babcock 4272; Deep Creek, Warner Mts., *L. S. Smith* 1103; Egg Lake, Modoc Co., *M. S. Baker;* Tule Lake (s. end), ne. Siskiyou Co., *M. H. Mitchell;* Weed (11 mi. ne.), Siskiyou Co., *Johnson & Palmer.* North Coast Ranges: Hayfork Valley, Trinity Co., *Tracy* 6473; Klamath River, n. of Yreka, *Butler* 742.

Refs.—Phacelia linearis Holz., Contrib. U. S. Nat. Herb. 3:242 (1895); Jepson, Man. 827 (1925). *Hydrophyllum lineare* Pursh, Fl. 1:134 (1814), type loc. "on the banks of the Missouri" River, *Lewis. Eutoca menziesii* R. Br.; Richards., Bot. App. Franklin Voy. 764, t. 27, figs. 1–5 (1823), based on *Hydrophyllum lineare* Pursh. *Phacelia menziesii* Torr.; Wats., Bot. King 252 (1871). *Eutoca multiflora* Dougl.; Lindl., Bot. Reg. t. 1180 (1828), "northwest of N. Am.," *Douglas.*

II.—Subgenus Gymnobythus. Corolla without scales; ovules 25 to 60 to each placenta; seeds small, not transversely corrugated.

51. **P. viscida** Torr. Stems simple or branching, ¾ to 2¼ feet high; herbage densely viscid-glandular and hirsute; leaf-blades ovate or roundish, cuneate or truncate at base, doubly serrate or irregularly dentate, ½ to 3½ inches long; petioles longer or shorter than the blades, the upper blades sessile; racemes few to many-flowered, soon becoming loose; pedicels spreading and a little curved, ¼ to 5 (or 9) lines long; calyx-lobes linear, about equaling the capsule; corolla deeply saucer-shaped or rotate-campanulate, deep blue with purple or whitish center (or sometimes entirely white) or with 5 yellowish spots at center, 6 to 9 (or 11) lines broad; stamens included; filaments slender, sparingly pilose; ovary flattened at apex, the flattened edges hairy; style cleft to below middle.

Open sandy hillslopes or valley flats, 50 to 2000 feet: along the coast from southern Monterey Co. to San Diego Co. Apr.-June.

Locs.—Jolon grade, Monterey Co., *Hall* 9972; Paso Robles, *Barber;* Lopez Cañon near San Luis Obispo, *Ramona Reed* 460; San Miguelito Cañon, 3 mi. sw. of Lompoc, *Munz* 10,248; Santa Rosa Isl.; Pelican Bay, Santa Cruz Isl., *Jepson* 12,110; Sycamore Cañon, Santa Ynez Mts., *Jepson* 9136; Santa Catalina Isl.; upper Sespe Creek, n. Ventura Co., *Munz* 13,175; Sherman, Los Angeles Co., *Braunton* 351; Santiago Creek, Santa Ana Mts., *Alice King;* San Pasqual Valley, San Diego Co., *Jepson* 19,185.

Refs.—Phacelia viscida Torr., Bot. Mex. Bound. 143 (1859); Jepson, Man. 818 (1925). *Eutoca viscida* Benth.; Lindl., Bot. Reg. t. 1808 (1836), type from Cal., *Douglas. Cosmanthus viscidus* DC., Prodr. 9:296 (1845). *Eutoca albiflora* Nutt., Jour. Acad. Phila. ser. 2, 1:158 (1848), type loc. Santa Barbara, *Gambel. P. viscida* var. *albiflora* Gray, Proc. Am. Acad. 10:321 (1875); Jepson, Man. 818 (1925).

52. **P. grandiflora** Gray. Robust plant, the stem erect, branching, 1½ to 3 feet high; herbage dark glandular, the stems, racemes and calyces glandular-hispid with spreading hairs, the leaves substrigulose; leaf-blades roundish-ovate, cordate at base, doubly serrate, 1¼ to 6 inches long; petioles ¼ to 4½ inches long, or the uppermost subsessile; racemes dense, the pedicels short (½ to 2 lines long); calyx-lobes linear-spatulate; corolla blue, ½ to 1 inch long, 1⅛ to 2 inches broad; seeds minute, punctate-rugulose.

Dry slopes in loose soil, 10 to 2700 feet: near the coast from Santa Barbara Co. to San Diego Co. Apr.-June.

Locs.—Santa Barbara, *Jepson* 12,133; Santa Cruz Isl., *T. Brandegee;* Los Alisos Cañon, Santa Monica Mts., *Epling;* Glendale, near Los Angeles, *Parish* 1929; Rubio Cañon (foothills e.), San Gabriel Mts., *Peirson* 159; Escondido, *C. V. Meyer* 223; La Jolla, w. San Diego Co., *Clements* 101; Jamul, San Diego Co., *Alderson.*

Refs.—Phacelia grandiflora Gray, Proc. Am. Acad. 10: 321 (1875); Jepson, Man. 818 (1925). *Eutoca grandiflora* Benth., Trans. Linn. Soc. 17:278 (1837), type from Cal., *Douglas. Cosmanthus grandiflorus* DC., Prodr. 9:297 (1845). *Eutoca speciosa* Nutt., Jour. Acad. Phila. ser. 2, 1:158 (1848), type loc. near San Diego, *Nuttall.*

III.—Subgenus Whitlavia. Corolla scales proper not present; filaments with a dilation or with wings at base; seeds 5 to 30 to each placenta, not corrugated.

53. **P. parryi** Torr. Stem erect, slender, simple or sparingly branched above, leafy, ½ to 1¾ feet high; herbage glandular-puberulent and -hispid; leaf-blades

ovate, subcordate to obtuse at base, irregularly double-toothed or irregularly laciniate, or sometimes merely dentate, ¾ to 2 inches long, the lower long-petioled, the upper cauline shortly petioled or almost sessile; racemes loose, elongated in age; pedicels widely spreading, slender, curved a little, ¼ to 1 inch long; calyx-lobes linear; corolla subrotatish or open-campanulate, cleft about half-way, royal purple or deep violet with 5 tawny or whitish spots in the tube, 5 to 6 lines long, ¾ to 1⅛ inches broad, about twice the length of the calyx-lobes; filaments pilose, equaling or slightly exceeding the corolla, bearing at base somewhat quadrangular wings or dilations; ovary a little hairy; style sparsely hispid, cleft ⅓ to ½; capsule ovate, acuminate, slightly exceeding the calyx.

Sandy ridges, hillslopes or valley flats, 200 to 2500 (or 4500) feet: South Coast Ranges from Monterey Co. to San Luis Obispo Co.; coastal Southern California from Santa Barbara Co. to San Diego Co.; intramontane on west side of the Colorado Desert. South to Lower California. Mar.-June.

Locs.—South Coast Ranges: betw. King City and Jolon, Monterey Co., *Eastwood;* betw. San Luis Obispo and Pismo, *Ferris* 7536. Cismontane S. Cal.: Purisima Cañon, n. Santa Barbara Co., *Munz* 9282; Los Alisos Cañon, Santa Monica Mts., *Epling;* Santiago Creek, Orange Co., *Alice King;* Pala, San Diego Co., *Jepson* 8495; Palomar Mt., *Hewlett* 13; Escondido, *C. V. Meyer* 2; Ramona, San Diego Co., *Jepson* 8513; Mesa Grande, *E. Ferguson* 14; La Junta, near Jamul, San Diego Co., *Newlon* 343. West side of Colorado Desert: Coyote Creek, Santa Rosa Mts.; Carriso Creek, e. San Diego Co., *T. Brandegee.*

Var. **celata** Jepson & Hoover var. n. Plants 1½ to 7 inches high, the stem (proper) stout and usually short, rather densely leafy and bearing several spreading branches ending in short racemes; corolla purple, ½ inch long; filaments dilated a little at base but not toothed.—(Plantae 1½–7 unc. altae; caulis validus, plerumque brevis, subdense foliatus; rami plures, patentes, in racemis brevibus terminantes; corolla purpurea, ½ unc. longa; filamenti basi paulo dilatati, non dentati).—Gravelly washes or flats, 500 to 2400 feet, west side of the Colorado Desert: Whitewater, San Gorgonio Pass, *S. B. Parish* (type); Deep Cañon, Santa Rosa Mts., *S. Walker;* Sentenae Cañon, below San Felipe Valley, e. San Diego Co., *Jepson* 12,464a.

Refs.—PHACELIA PARRYI Torr., Bot. Mex. Bound. 144 (1859), type loc. "mts. e. of San Diego," *Parry;* Jepson, Man. 818 (1925). Var. CELATA Jepson & Hoover.

54. **P. nashiana** Jepson sp. n. Plant compact, 4 to 8 inches high, the proper stem or main axis stout, short (1 to 3 inches long), densely clothed below with leaves and bearing at apex several flowering branches; flowering branches stout, bearing only 1 or 2 reduced leaves and ending in short several-flowered racemes; leaf-blades orbicular and cordate at base to ovate and obtuse, crenate, thick, coriaceous, ½ to 1 inch long, the petioles ½ to 2¼ inches long; racemes loose, 1 to 3 inches long, the fruiting pedicels stoutish, 3 to 6 lines long, a little curved; calyx-lobes linear, ⅓ to ½ as long as the corolla; corolla purple, subrotatish or turbinate-campanulate, 6 to 9 lines long, 7 to 14 lines broad, cleft about half-way into broad rounded lobes, furnished with a deltoid whitish spot beneath each sinus midway of the tube; stamens shorter than or equaling the corolla, the filaments pilose at middle and dilated or winged at base, each wing bearing at apex a spreading subulate tooth; capsule with 55 to 60 seeds. (Planta compacta, 4–8 unc. alta; caulis proprius validus, brevis (1–3 unc. longus), infra dense foliatus, supra plures ramulos floriferos gerens; rami floriferi validi, paucifoliati, in racemis plurifloribus brevibus terminantes; laminae foliorum orbiculatae, basi cordatae, vel ovatae basi obtusae, crenatae, crassae, coriaceae, ½–1 unc. longae; petioli ½–2¼ unc. longi; racemi laxi, 1–3 unc. longi; pedicelli subvalidi, 3–6 lin. longi, paulo curvati; lobi calycis lineares, ⅓–½ longitudinis corollae; corolla purpurea, subrotata vel turbinato-campanulata, 6–9 lin. longa, 7–14 lin. lata, in lobis orbicularis usque ad mediam partem divisa, macula deltoidea subalba in medio tubi sub quoque sinu ornata; stamina corolla breviora vel aequantia; filamenta in medio pilosa, basi dilatata vel alata; ala quaeque apice dente subulato patenti; capsula 55–60-seminata.)

Sand slides in cañons, 6000 to 6250 feet: Nine-mile Cañon, southwestern Inyo Co., in the Sierra Nevada. May.

Ref.—Phacelia nashiana Jepson; type loc. Nine-mile Cañon, sw. Inyo Co., *Charlotte Nash Smith* 160 (typ. in Herbario Jepsoniano).

55. **P. longipes** Torr. Stems erect or ascending, branching at or above the base, hirsute or hirsutulous with spreading hairs, 3 to 15 inches high; herbage densely glandular throughout; leaf-blades ovate or orbicular, cordate at base, usually rounded at apex, coarsely and obtusely crenate, ½ to 1¾ inches long; petioles mostly much longer; racemes loose, the pedicels subhorizontally spreading and curved, becoming 2 to 7 lines (or even to 2¼ inches) long; calyx-lobes linear, 2 to 3 lines long; corolla sordid-white, open-campanulate, usually parted to the middle, 4 to 6 lines long; scales none; stamens slightly pilose at or near the base, little longer than the corolla; filaments narrowly deltoid-dilated or ovately dilated at base; style pilose, deeply 2-cleft; ovules about 5 to 8 to each placenta; seeds thickly punctate.

Gravelly slopes or rock slides in the mountains, 3000 to 7500 feet: coastal Southern California from Santa Barbara Co. to the San Gabriel Mts. May-Aug.

Locs.—Santa Barbara Co., *Torrey*. Northern Los Angeles Co.: Richardson Cañon near Sawmill Mt., *Davy* 2492. San Gabriel Mts.: Rock Creek, *Parish* 1979; Pacoima Cañon, *Peirson* 381; Mt. Wilson, *Davidson*; Cucamonga Peak, *Parish* 441; Coldwater Cañon, San Antonio Mts., *Abrams* 2711; Lytle Creek Cañon, *Hall* 900. The above cited collections appear to be of two races, one (a) with coarse stems, very glandular herbage and thick leaves (represented by mts. n. of Claremont, *C. F. Baker* 5318), the other (b) with slender stems, less glandular herbage and thin leaves (represented by Icehouse Cañon, San Antonio Mts., *Parish* 11,950).

Refs.—Phacelia longipes Torr.; Gray, Proc. Am. Acad. 10:322 (1875), type loc. Santa Barbara Co., *Torrey;* Jepson, Man. 818 (1925). *P. cordifolia* Wats.; Brand in Engler, Pflzr. 4^{251}:72 (1913).

56. **P. minor** Thell. California Blue Bells. Stem erect, simple or branching, hispid with short spreading hairs, ½ to 2 feet high; herbage glandular-viscid throughout; leaf-blades broadly or round-ovate, cordate or truncatish at base, coarsely and sometimes doubly serrate, strigose, 1 to 2½ inches long, the lower long-petioled, the upper short-petioled or nearly sessile; racemes elongated; pedicels horizontally or sub-horizontally spreading, the lower ¼ to 1¼ inches long, usually curved; calyx-lobes linear, 4 lines long; corolla blue or purple, broadly long-tubular, the tube a little ventricose, rounded at base, as broad or even a little broader below than above (that is at the throat), ½ to 1¼ inches long, 3 to 5 lines broad, the limb 5 lines to 12 lines broad; stamens usually exceeding the corolla; filaments with an oblong hairy dilation at base.

Loamy or gravelly soil of valley flats, mesas and arid foothill slopes, 800 to 3000 (or 5250) feet: coastal Southern California from the Santa Monica Mts. to the San Jacinto Mts. and south to San Diego Co.; northwest arm of the Colorado Desert. Apr.-May.

Locs.—Coastal S. Cal.: Mandeville Cañon, Santa Monica Mts., *Clokey & Templeton* 4532; San Gabriel Cañon, San Gabriel Mts., *C. E. Hutchinson;* San Bernardino Valley (e. end), *Jepson* 5566; Riverside, *Jepson* 1213; Chalk Hill, Mt. San Jacinto, *C. V. Meyer* 754; Anaheim plain, Orange Co., *Alice King;* Trabuco Cañon, Santa Ana Mts., *Wolf* 1830; Elsinore (hills 5 mi. n.), *Jepson* 12,435; Aguanga, sw. Riverside Co., *Jepson* 17,158; Fallbrook, nw. San Diego Co., *Cleveland;* Oak Grove Valley, e. San Diego Co., *Jepson* 17,152. Colorado Desert: Mission Creek, nw. arm of Conchilla Desert, *Clary* 1611; Andreas Cañon, San Jacinto Mts., *Newlon* 444.

Refs.—Phacelia minor Thell., Berichte Bayer. Bot. Gesell. 14:79 (1914); Jepson, Man. 819 (1925). *Whitlavia minor* Harvey; Hook., Lond. Jour. Bot. 5:312, t. 12 (1846), type from Cal., *Coulter* 493. *P. whitlavia* f. *minor* Brand; Engler, Pflzr. 4^{251}:71 (1913). *Whitlavia grandiflora* Harvey, l.c. 5:312, t. 11 (1846), type from Cal., *Coulter* 492; not P. grandiflora Gray. *P. whitlavia* Gray, Proc. Am. Acad. 10:322 (1875); Brand in Engler, Pflzr. 4^{251}:69 (1913); Jepson, Fl. W. Mid. Cal. ed. 2, 341 (1911). *P. minor* var. *whitlavia* Mcbr., Contrib. Gray Herb. 49:24 (1917). *P. whitlavia* var. *jonesii* f. *heterostyla* Brand, l.c. 71, type loc. Pasadena, *Jones* 3031; f. *gracillima* Brand, l.c., type loc. Fallbrook, San Diego Co., *Jones* 3099.

57. **P. campanularia** Gray. Desert Blue Bells. Stem branching from the base, 1 to 2 feet high, glandular-hispid with spreading hairs and puberulent (as also the racemes); leaf-blades round-ovate, dentate, cordate or truncatish at base,

strigose, 1 to 3 inches long; petioles ½ to 8 inches long; racemes loose; fruiting pedicels spreading or horizontal, ¼ to 1 inch long; calyx-lobes linear, glandular-hispid and -puberulent; corolla deep blue, funnelform-campanulate (the tube widened upward, not at all ventricose), ¾ to 1½ inches long, the limb ½ to 1½ inches broad; corolla-lobes twice as broad as long; stamens exserted, the filaments with a quadratish dilation at base, the dilation glabrous or sometimes hairy.

Sandy desert washes, rocky outcroppings or stream beds in valleys, 1600 to 4500 feet: Mohave and Colorado deserts. Mar.-May. The herbage stains paper and is a skin irritant.

Locs.—Mohave Desert: Providence Mts., *Jepson* 18,259 (Gilroy Cañon), 18,288 (Bonanza King Cañon); Willow Springs Cañon, Old Dad Mts., *Jepson* 20,418; Kane Sprs., s. of Newberry, *Mary Beal;* Daggett, *Mary Beal;* Ord Mts., *Jepson* 5883. Colorado Desert: Whitewater Cañon, *Marjorie Clary* 18; Cottonwood Spr., Eagle Mts., *Jepson* 12,551; Grapevine Spr., e. San Diego Co., *Jepson* 8753a; Box Cañon, Mason Valley, e. San Diego Co., *Jepson* 8650.

Refs.—PHACELIA CAMPANULARIA Gray, Syn. Fl. 2:164 (1878), type loc. San Bernardino Co., *Parry & Lemmon* (without doubt transmontane, most probably in the southern Mohave Desert, near headwaters of the Mohave River). *P. minor* var. *campanularia* Jepson, Man. 819 (1925).

IV.—Subgenus MICROGENETES. Corolla without scales or the scales very narrow or indistinct; ovules more than 2 to each placenta; seeds transversely corrugated.

58. **P. ivesiana** Torr. Stems several to many from the base, diffusely or bushy-branching, 2 to 5 (or 8) inches high; herbage thinly hirsute, pubescent and somewhat glandular throughout; leaf-blades oblong or linear in outline, ½ to 1 (or 2½) inches long, pinnately parted, the lobes oblong-linear, usually entire or sometimes slightly toothed, 1 to 2 lines long; petioles ½ to as long as the blades; racemes relatively few-flowered; calyx-lobes linear-spatulate, 2 lines long, the tips often recurved or spreading; corolla white or pale purple, nearly tubular, 1½ to 2 lines long, equaling the calyx to 1¼ times as long; scales mostly wanting or very narrow; stamens included; capsule glandular, conspicuously shorter than the calyx.

Flats of desert valleys, 200 to 8000 feet: Colorado Desert; central and eastern Mohave Desert; east side of the Sierra Nevada from Inyo Co. to Siskiyou Co. East to Utah and Wyoming, north to Idaho and Washington. Mar.-June.

Locs.—Colorado Desert: Borrego Spr., *T. Brandegee;* Coachella, *Schellenger;* Paloverde Valley, *Schellenger.* Mohave Desert: Muroc sta. (Yucca), *K. Brandegee;* Twenty-nine Palms, *T. Brandegee;* Kelso, *K. Brandegee;* Needles, *Parish* 9636. Inyo Co.: Surprise Cañon, Panamint Mts., *Ferris* 7937; Big Pine, *K. Brandegee.* Lassen Co.: Susanville (Engler, Pflzr. 4^{251}:126). Modoc Co.: Surprise Valley, *Lemmon.* Eastern Siskiyou Co.: Mayten, Little Shasta Valley, *Jepson* 20,001. Nev.: Chiatovich Creek, n. White Mts., *Duran* 563.

Refs.—PHACELIA IVESIANA Torr.; Bot. Ives 21:(1860), type loc. Diamond River, lower Colorado River, *Ives;* Jepson, Man. 829 (1925). *P. campestris* Nels., Bull. Torr. Club 26:242 (1899), type loc. Granger, Wyo., *Nelson* 4696. *P. ivesiana* f. *campestris* Brand; Engler, Pflzr., 4^{251}:126 (1913). *P. glandulifera* Piper, Contrib. U. S. Nat. Herb. 11:472 (1906), type loc. Paseo, Wash., *Piper* 2954. *P. ivesiana* f. *glandulifera* Brand, l.c. *P. ivesiana* var. *glandulifera* Nels. & Mcbr., Contrib. Gray Herb. 49:40 (1917).

59. **P. affinis** Gray. Stems erect, few or several from the base, simple or sparingly branched, 3 to 12 inches high; herbage glandular-puberulent; leaves remotely scattered along the stems but mostly basal or sub-basal, the blades ¾ to 4 inches long, pinnately but irregularly parted into many lobes, the divisions or leaflets oblong, obtuse, few-toothed or entire, 1 to 4 (or 5) lines long, often with small obtuse or triangular lobes between; racemes densely flowered or sometimes soon laxly flowered; calyx-lobes mostly straight (not recurving at tip), spatulate, ciliate-glandular; corolla pale purple, pale lavender or whitish, oblong-campanulate, 1½ to 2½ lines long, about equaling the calyx, its scales narrowly linear, inconspicuous or obsolete; stamens included; style slightly bifid at apex, shorter than the calyx; capsule a little shorter than the calyx, rather closely erect or ascending, transversely furrowed; seeds reticulate but with conspicuous transverse corrugations.

Mountain slopes and cañons, 1000 to 3000 feet: desert slopes San Gabriel Mts.; west side of the Colorado Desert. South into Lower California, east to Arizona and Utah. Apr.-May.

Locs.—San Gabriel Mts.: Arrastre Cañon, *Peirson* 410. Eastern San Diego Co.: Grapevine Spr., *T. Brandegee;* San Felipe Valley, *Jepson* 17,126; Jacumba, *T. Brandegee.*

Refs.—PHACELIA AFFINIS Gray, Syn. Fl. ed. 2, 2:417 (1886), type loc. mts. of n. L. Cal., *Orcutt;* Jepson, Man. 829 (1925). *P. rugulosa* Lemmon; Greene, Pitt. 1:175 (1888), type from L. Cal., *Lemmon* (near Ensenada per Lemmon Herb.).

60. **P. fremontii** Torr. (Fig. 405.) Stems few to many from the base, diffuse or ascending, 6 to 12 inches high; herbage rather densely pubescent, the inflorescence and calyces glandular; leaf-blades oblong in outline, ½ to 2½ inches long, the divisions or lobes oblong or obovate, entire or sometimes few-toothed or few-cleft, ½ to 4 lines long, often with smaller lobes between; basal leaves long-petioled, upper short-petioled or almost sessile; flowers in spike-like racemes, the pedicels ½ line long; corolla broadly funnelform or campanulate, lilac-blue or violet, with yellow throat, 5 to 7 lines long, 2 times as long as the spatulate calyx-lobes; scales narrow, wholly adnate to corolla and free from the filaments or none; filaments glabrous; seeds transversely or somewhat spirally ridged and with longitudinal reticulations.

Sandy soil of plains, cañons and desert mesas, or on alkaline flats, 200 to 7400 feet: inner South Coast Range from western San Joaquin Co. to northeastern Santa Barbara Co.; San Joaquin Valley from Fresno Co. to Kern Co.; Tehachapi Mts.; southern Sierra Nevada in Kern Co.; Inyo Co.; Mohave Desert and its bordering ranges on the west; northern Colorado Desert. East to Utah and Arizona. Mar.-June.

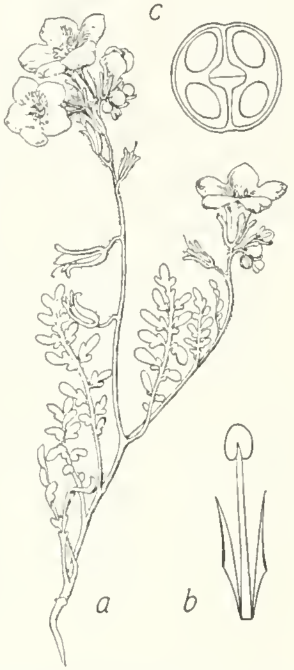

Fig. 405. PHACELIA FREMONTII Torr. *a*, habit, × 1; *b*, stamen and scales, × 5; *c*, cross-sect. of ovary, × 6.

Locs.—Inner South Coast Range: Corral Hollow, w. San Joaquin Co., *Hoover* 3032; Alcalde, sw. Fresno Co., *T. Brandegee;* Elkhorn Scarp, Temblor Range, se. San Luis Obispo Co., *Jepson* 16,225; Cuyama Valley, ne. Santa Barbara Co., *Munz* 13,620. San Joaquin Valley: Kerman (9 mi. s.), *Hoover* 1778; Mendota plain (6 mi. s. of Mendota), *Jepson* 16,990; Huron, Fresno Co., *T. Brandegee;* Bakersfield, *Allison Krames.* Tehachapi Mts.: Keene sta., *K. Brandegee.* Southern Sierra Nevada in Kern Co.: Long Tom Mines, Greenhorn Mts., *C. N. Smith* 253; Piute Mts., *C. N. Smith* 169. East side of Sierra Nevada: Honey Lake, Lassen Co., *T. Brandegee;* Red Rock, se. Lassen Co., *Blankinship;* near Mono Lake, *Ottley* 1051; Bishop, *Almeda Nordyke;* Alabama Hills, near Lone Pine, *Renner* 57; pass betw. Inyo Mts. and Coso Mts., *Jepson* 19,540; Darwin, *Renner* 30; Hanaupah Cañon, Panamint Mts., *Jepson* 6973a; Gold Valley, Black Mts., *L. Saylor* 274. Mohave Desert and its westerly bordering ranges: Frazier Mt. (3 mi. se.), n. Ventura Co., *Nordstrom* 433; Arrastre Creek, San Gabriel Mts., *Peirson* 400; Lancaster, *Clokey & Templeton* 4655; Cajon Pass, *Jepson* 17,166; Byrne's Spr., San Bernardino Mts., *Parish* 2960; Randsburg, *Heller* 7687; Red Rock Cañon, w. end El Paso Mts., *Allison Krames;* Hawes sta., *Jepson* 15,550; Barstow, *Jepson* 5378; Coolgardie Yucca Mesa (n. of Calico Mts.), *Jepson* 6628; Ord Mt., *Jepson* 5887; Old Dad Mts. (mesa near), *Jepson* 20,506; Cedar Cañon, Mid Hills, Providence Mts., *Jepson* 18,333; New York Mts., *Jepson* 5449. Northern Colorado Desert: Dead Indian Trail (15 mi. w. of Indio), Conchilla Desert, *Clary* 861; Deep Cañon, Santa Rosa Mts., *Yates* 6474.

Refs.—PHACELIA FREMONTII Torr. Bot. Ives 21 (1860), type loc. Yampai Valley, Coconino Co., Ariz., *Ives;* Jepson, Man. 829, fig. 793 (not P. "douglasii"), (1925). *P. hallii* Brand, Beitr. Hydroph. 8 (1911), type loc. Swartout Cañon, San Antonio Mts., *Hall* 1264; Jepson, Man. 830 (1925); this is the equivalent of the small-flowered form of P. fremontii which is common in Nev. and Utah; the type, *Hall* 1264 (Swartout Cañon), in every detail of pubescence, leaves, racemes and flowers, is exactly like *Hall* 1494 (true P. fremontii, Swartout Cañon), save in size of corolla;

a slight or obscure difference in habit may be ecological. *Phacelia bicolor* Torr.; Wats., Bot. King, 255 (1871), type loc. Carson City, Nev., *Stretch;* Jepson, Man. 829 (1925). There are only inconstant leaf-differences between this form and P. fremontii. The corolla-scales are united with the filaments for more than one-half their length in Phacelia bicolor; in P. fremontii the corolla-scales are usually wholly free from the filaments, though sometimes partly united with them below. This partial differentia in the scales of Phacelia bicolor and P. fremontii does not, however, seem, in reality, to be important in segregating two units—in view of the fact that the two forms agree in practically all features of habit and in all other details of flowers and fruit. The lack of reliability in the scale character is somewhat emphasized by the entire absence of scales in some collections of plants referred to P. fremontii and of others referred to P. bicolor. Phacelia fremontii seems always to have glabrous filaments, but in P. bicolor the filaments are either hairy below or glabrous. The status of P. bicolor seems, at this time, uncertain on the basis of California material.

61. **P. brachyloba** Gray. Stem erect, with many branches from the base or subsimple, 1 to 1½ feet high; herbage hirsutulous, the stems glandular; leaf-blades linear to oblong in outline, 1 to 2½ inches long, coarsely toothed, pinnatifid or pinnately parted, the lobes oblong, mostly obtuse, often somewhat dentate; racemes spicate, densely flowered; calyx-lobes linear-spatulate, glandular-pubescent, 2 lines long; corolla white, or clear pink-lavender with yellow throat, campanulate, 3 to 4 lines long, the throat bearing an oblong-ovate areola behind each stamen and a pair of smaller ones between each two of these; scales of corolla usually absent; stamens included; filaments toward base narrowly dilated downward; style shortly cleft; capsule oblong, shorter than the calyx; seeds inconspicuously corrugated.

Sandy soil of cañons, washes or mountain flats, 1500 to 5500 feet: Monterey Co. to San Diego Co. South to Lower California. May-June.

Field note.—Phacelia brachyloba is a "fire plant." On Palomar Mountain, in the summer of 1941, after a wide-spread conflagration covering the entire east face of the mountain, it whitened the slopes for miles. Of the rather numerous fire plants, it was the most abundant. This species also displays similar color phenomena on "burns" in the San Gabriel Mountains.—F. W. Peirson.

Locs.—Finches ranch, Arroyo Seco, Santa Lucia Mts., *Brewer* 674; Cold Springs Cañon, Santa Ynez Mts., *A. L. Grant* 1694; Ojai Valley, *Hubby;* San Francisquito Pass, n. Los Angeles Co., *Hall* 3092; Mt. Wilson, *Peirson* 160; San Gabriel Cañon, San Gabriel Mts., *C. E. Hutchinson;* Cajon Pass, *Jepson* 6104; San Bernardino, *Parish* 3657; Yucaipa Hills, near Redlands, *F. M. Reed* 2793; San Jacinto Cañon below Strawberry Valley, San Jacinto Mts., *Jepson* 1282; betw. Vandeventer Flat and Pinyon Flats, Santa Rosa Mts., *Clary* 985; Glen Ivy trail, Santa Ana Mts., *Munz* 7055; Del Mar, w. San Diego Co., *Belle Angier;* Jacumba, se. San Diego Co., *Jones.*

Refs.—PHACELIA BRACHYLOBA Gray, Proc. Am. Acad. 10:324 (1875); Parish, Erythea 6:90 (1898); Jepson, Man. 830 (1925). *Eutoca brachyloba* Benth., Trans. Linn. Soc. 17:277 (1837), type from Cal., *Douglas. P. cooperae* Gray, l.c. 15:49 (1879), type loc. Santa Ynez Mts., *Cooper. P. orcuttiana* Gray, l.c. 19:88 (1883), type loc. mts. of L. Cal. near U. S. border, *C. R. Orcutt. P. leucantha* Lemmon; Greene, Pitt. 1:175 (1888), type loc. Del Mar, San Diego Co., *Lemmon.*

62. **P. pachyphylla** Gray. Stem compactly branched, forming a low dwarf 1 to 2½ inches high; herbage viscid or glandular-pubescent throughout; leaf-blades roundish to ovate, thickish, rounded at apex or obtuse, cordate or subcordate at base, crenate or entire, (¼ or) ½ to 1⅛ inches long, the petioles half as long or longer; racemes 2 to 4, dense, short (½ to 1 or 2 inches long), borne in a small compact panicle not exceeding the leaves or sometimes twice as long, or the panicle sometimes reduced to a single raceme; calyx-lobes glandular, narrowly oblong, 1 to 1½ lines long; corolla pale purple or pink, narrowly campanulate, 2 to 2½ lines long; scales narrowly linear; stamens included; style cleft half way; capsule subglobose, slightly exceeding the calyx.

Alkaline desert flats or gravelly desert mesas, 200 to 3000 feet: central and eastern Mohave Desert; Colorado Desert. South into Lower California, east to Arizona. Apr.-May.

Locs.—Mohave Desert: Baker (15 mi. n.), *Munz* 12,604; flats betw. Bristol Mts. and Marble Mts., *Jepson* 20,366. Colorado Desert: Paloverde, *Hall* 5955; Salvation Spr., Chuckwalla Mts., *Hall* 5867; Carrizo Mt., *T. Brandegee;* Signal Mt., *T. Brandegee.* In the Mohave Desert occur also loosely branching forms 2 to 5 inches high: Lucerne Valley (12 mi. e.), *Munz* 15,162; Kane Springs wash, Ord Mt., *Jepson* 15,535; Hector, *Hall* 6121; Red Rock Cañon, w. end El Paso Mts., *Munz* 12,448. All these loosely branched plants have small corollas as in typical P. pachyphylla, but in habit resemble more closely Phacelia calthifolia and are thus different in aspect from the compact dwarfs of the former species.

Refs.—PHACELIA PACHYPHYLLA Gray, Proc. Am. Acad. 19:88 (1883), type loc. Calico Mines, Calico Mts., cent. Mohave Desert, *S. B. & W. F. Parish;* Jepson, Man. 830 (1925). *P. neglecta* Jones, Contrib. W. Bot. 12:50 (1908), type loc. Needles, San Bernardino Co., *Jones* 3792.

63. **P. calthifolia** Brand. Stem stout, erect, commonly branching from the base, 3½ to 11 inches high; herbage densely glandular-pubescent throughout, staining paper brownish in drying; leaves mostly basal or subbasal; leaf-blades suborbicular or orbicular-ovate and subcordate, crenate or crenulate, 1 to 2 inches long, the lower long-petioled, the upper almost sessile and nearly opposite, smaller; racemes less densely flowered than in P. pachyphylla, 1½ to 6 inches long, the flowers almost sessile; calyx-lobes broadly linear, 2 to 3 lines long, very glandular and often very black; corolla purple, broadly campanulate, 4 to 6 lines long; scales narrow, adnate to corolla, united below to the base of filament so that the pair makes a pocket behind stamen; stamens unequal, included; capsule oblong-rotund, equaling or slightly exceeding calyx.

Sandy or gravelly washes or flats or talus slopes, –280 to 2000 feet: Death Valley region, Inyo Co.; south into the central Mohave Desert. Apr.-May.

Locs.—Inyo Co.: Panamint Cañon, Panamint Range, *Hall & Chandler* 7056; Grotto Cañon, Panamint Range, *Epling, Robison & Haines;* Bad Water, Death Valley, *J. Grinnell;* Furnace Creek, Funeral Mts., *Jepson* 6916; Bradbury Well, *C. L. Hitchcock* 12,531; Zabriskie, *Parish* 10,056. Mohave Desert: Ludlow (11 mi. e.), *Newlon* 523.

Refs.—PHACELIA CALTHIFOLIA Brand, Beitr. Hydroph. 8 (1911), type loc. Pleasant Cañon, Panamint Mts., *Hall & Chandler* 6932; Jepson, Man. 830 (1925). *P. pachyphylla* Cov., Contrib. U. S. Nat. Herb. 4:159 (1893); not Gray.

64. **P. gymnoclada** Torr. Stems several from the base, radiately branching, the branches 5 to 9 inches long, decumbent; herbage hirsutulous; leaf-blades oblong to elliptic, coarsely crenate, ½ to 1¼ inches long, on petioles ⅓ to as long; racemes becoming loose; calyx-lobes linear, ½ to ⅔ the length of corolla; corolla purple, campanulate, 4 lines long, shallowly lobed (the lobes transversely elliptic); stamens ½ as long as corolla; style shortly bifid at apex; capsule 8 to 16-seeded.

Sandy foothills, 4000 to 6000 feet: eastern borders of California in Sierra Co. and perhaps Mono Co. East to western Nevada. June.

Locs.—No precise station for Phacelia gymnoclada is known in California but there is a record of occurrence in Sierra Co. (Engler, Pflzr. 4^{251}:129). This species has, in addition, been attributed to Mono Co. and it may occur, since a definite station in the state of Nevada, namely, mouth of Pinchot Creek, White Mts., Esmeralda Co., *Duran* 3261, lies within a few miles of the Mono County, California, line.

Ref.—PHACELIA GYMNOCLADA Torr; Wats., Bot. King 255 (1871), type loc. foothills of the Truckee Mts. (n. of Wadsworth), Nev., *Watson.*

7. **MILTITZIA** A. DC.

Annuals, similar to Phacelia. Flowers in racemes, the pedicels during anthesis commonly ⅕ to ½ as long as the flowers. Calyx-lobes linear (or linear-oblanceolate). Corolla persistent, the scales in its tube very minute. Ovary 2-celled by meeting of the placentae in the center, the placentae very narrow, borne on half-partitions; ovules 2 to 8 to each placenta. Style in ours persistent. Capsule ovoid, compressed.—Species 5, western North America. (Friederich von Miltitz of Dresden, author of a handbook of botanical literature, 1829.)

Corolla 1½ to 2 times as long as calyx; flowers ascending, the pedicels straightish or slightly curved, ½ to 1½ lines long; Lassen Co. .... 1. *M. lutea.*
Corolla only slightly exceeding calyx; flowers spreading, the pedicels retrocurved, 1 to 2 lines long; Inyo Co. .... 2. *M. inyoensis.*

1. **M. lutea** A. DC. Stems several from the base, branching, procumbent or diffuse, 2½ to 6 inches long; herbage pubescent, the inflorescence usually slightly

glandular; leaf-blades broadly oblong or ovate, pinnatifid, 5 to 12 lines long, narrowed to a petiole; racemes short (½ to 1½ or 2 inches long), the flowers a little crowded; pedicels ¼ to ½ as long as the calyx; corolla orange, 2¾ to 3 lines long, 1½ to 2 times as long as the calyx, minutely hirsutulous outside.

Sandy clay soil of valleys and plateau plains, 4000 to 5000 feet: Lassen Co. Western Nevada to eastern Oregon. June-July.

Locs.—Ravendale, *Keck & Clausen* 3736; Madeline Plains, *C. C. Bruce* 2198; Secret Valley, *Applegate* 8912.

Refs.—MILTITZIA LUTEA A. DC., Prodr. 9:296 (1845). *Eutoca lutea* H. & A., Bot. Beech. 373 (1840), type loc. "Snake Fort, Snake Country," Ida., *Tolmie*. *Emmenanthe lutea* Gray, Proc. Am. Acad. 10:329 (1875). *Emmenanthe glandulifera* Torr.; Wats., Bot. King 257 (1871), type loc. Virginia Mts., Nev., *Watson* 885. *M. glandulifera* Hel., Muhl. 8:20 (1912); Jepson, Man. 830 (1925). *M. glandulifera* var. *californica* Brand, Univ. Cal. Publ. Bot. 4:224 (1912), type loc. Madeline Plains, Lassen Co., *Bruce*.

2. **M. inyoensis** Mcbr. Stems few from the base, diffuse or trailing, 1 to 2¾ inches long; herbage and calyces minutely spreading-hispidulous; leaf-blades oblong, 2 to 5 lines long, usually sinuately 5-lobed, the lobes obtuse, on petioles 1 to 3 times as long; racemes loose, ¼ to 1½ inches long, the pedicels filiform, ½ to as long as calyx, retrocurved; calyx 1 to 1½ lines long, nearly as long as the corolla (in early anthesis); fruiting calyx 2 to 2¾ lines long; corolla yellow.

Dry peat bogs in the foothills, 4500 to 5500 feet: western Inyo Co. May.

Locs.—Bishop; Big Pine, *K. Brandegee*.

Refs.—MILTITZIA INYOENSIS Mcbr., Contrib. Gray Herb. 49:41 (1917), type loc. Bishop (foothills w.), Inyo Co., *Heller* 8324; Jepson, Man. 831 (1925).

8. **EMMENANTHE** Benth.

Annuals, similar to Phacelia. Leaves pinnately cleft to divided (rarely merely toothed). Flowers soon pendulous, borne on filiform pedicels about as long. Corolla cream-color or yellow, campanulate, persistent; scales none. Stamens included. Ovary 2-celled by the meeting of the placentae in center, the placentae wing-like or lamellate and borne on the half-partitions at right angles; ovules 4 to 8 to each cell, attached beneath the placental wings. Style shortly cleft at apex, deciduous. Capsule compressed, 2-celled or by reason of the placental wings imperfectly 4-celled.—Species 1. (Greek emmeno, to abide, and anthos, flower, the corolla not deciduous.)

1. **E. penduliflora** Benth. WHISPERING BELLS. (Fig. 406.) Stem erect, usually much branched from the base, 8 to 21 inches high; herbage villous-pubescent and somewhat viscid; leaf-blades ¾ to 4 inches long, sessile or subsessile, only the lower petioled, the lobes numerous, short, entire or sometimes toothed; racemes loose, straight, ascending, panicled at summit of the stem; corolla 4 to 5 lines long, the glabrous filaments adnate to the very base; ovary short-bristly and stipitate-glandular; seeds conspicuously pitted in somewhat regular lines.

Open or chaparral slopes, frequent on "burns," 10 to 6000 feet: Coast Ranges from Tehama Co. to San Luis Obispo Co.; Tehachapi Mts.; Sierra Nevada foothills from Amador Co. to Kern Co.; Inyo Co.; Mohave and Colorado deserts; cismontane Southern California. South to Lower California, east to Arizona. Mar.-July.

Geog. note.—Widely distributed in a great variety of climatic and physical areas, Emmenanthe penduliflora is found almost throughout the mountain region of cismontane California, and in both of the large deserts and in the transmontane deserts of Inyo County and in those of Arizona. In the North Coast Range of Mendocino County it grows within five miles of the borders of the Redwood belt near Ukiah, a coastal climate; it inhabits the west slopes of the Sierra Nevada in Amador county, a dry interior climate; and in favorable seasons it develops luxuriantly in the arid wastes of the western Colorado Desert, and also in the Granite Mountains, which lie to the south of the Avawatz Mountains in the northeastern Mohave Desert. Notwithstanding its wide range, it is remarkable for its constancy in habit and in morphological features. Throughout all these many habitats and varied combinations of topography and climate it preserves its characters with remarkable uniformity, because as an annual it adapts itself rather readily to the moisture and temperature conditions of March and April. These are approximately the same in the latter part of the rainy season in all these diverse climatic areas. Emmenanthe penduliflora has but one named subspecies or variety, var. rosea Brand, which inhabits the inner South Coast Range from southeastern Santa Clara County to Mt. Piños, where the variety apparently quite replaces the species.

Flower note.—The filaments are glabrous and about one-half the length of the corolla. The ovary is covered with stipitate glands and very short spreading bristles. The style is about one-half the length of the stamens; it is cleft with coiled lobes and terminal stigmas. The capsule is cylindric.

Locs.—Coast Ranges: Beegum, w. Tehama Co., *Jepson* 16,630; Alder Sprs. (10 mi. e.), Glenn Co., *Heller* 11,439; South Mill Creek, Ukiah, *Jepson* 9259; betw. Lower Lake and Kelseyville, Lake Co., *Jepson* 21,000; Collins Camp, Vaca Mts., *Jepson* 20,999; Mt. Diablo, *Jepson* 9075; Corral Hollow, *May Arnold;* Fremont Peak, Gabilan Mts., *Elmer* 4698; San Miguelito rancho, near Jolon, Monterey Co., *Jepson;* San Luis Obispo, *Summers.* Tehachapi Mts.: Caliente Creek, *Davy* 1872. Sierra Nevada: Drytown, Amador Co. (Univ. Cal. Publ. Bot. 4: 224); Vallecito, Calaveras Co., *A. L. Grant;* Priest Hill, Tuolumne Co., *A. L. Grant* 798; Coulterville, Mariposa Co., *Jepson* 20,998; Kern River Cañon, Greenhorn Mts., Kern Co., *Allison Krames.* Inyo Co.: Black Cañon, White Mts., *Duran;* Bishop, *Almeda Nordyke;* Johnson Cañon, Panamint Range, *Jepson* 19,698. Mohave Desert: Cave Sprs., Avawatz Mts., *Mary Beal;* Granite Mts. (s. of Avawatz Mts.), *Jepson* 17,298; Old Dad Mts., *Jepson* 20,449; Spanish Mine, Providence Mts., *Mary Beal* 610; Bagdad-Chase Mine, Bullion Mts., acc. *Mary Beal;* Helendale, *Mary Beal.* Colorado Desert: Mecca Hills, *L. J. Childs;* Andreas Cañon, San Jacinto Mts., *Newlon* 445; Palm Cañon, San Jacinto Mts., *Jepson* 1363; San Felipe Narrows, *C. V. Meyer* 36; Box Cañon, near Mason Valley, e. San Diego Co., *Jepson* 8662. Cismontane S. Cal.: Cuddy Valley, Mt. Piños, *Hall* 6406; Mono Flat, Santa Barbara Co., *A. L. Grant* 1742; Portal Ridge, n. Los Angeles Co., *Jepson* 17,069; Huntington Palisades, Los Angeles, *Julia A. Bettys;* Rubio Cañon, San Gabriel Mts., *Peirson* 168; Cajon Cañon, *Jepson* 6096; San Bernardino, *Jepson* 5540; Gavilan Mesa, Riverside Co., *Clokey* 6846; Elsinore (5 mi. n.), sw. Riverside Co., *Jepson* 12,427; San Diego, *T. Brandegee.*

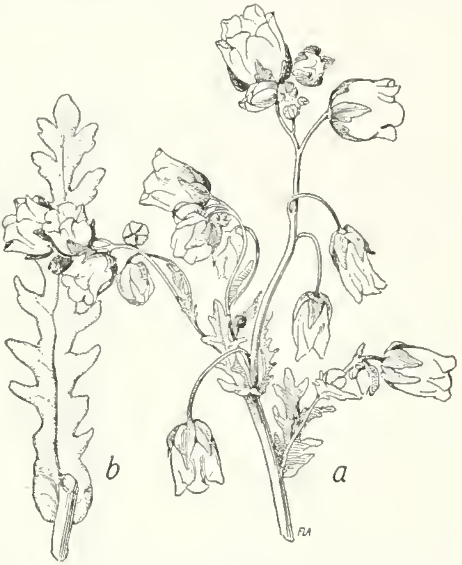

Fig. 406. EMMENANTHE PENDULIFLORA Benth. *a*, fl. branchlet, × 1; *b*, leaf, × 1.

Var. **rosea** Brand. Herbage brown; corolla pink-brown, fading white in drying, apparently not at all yellowish.—Inner South Coast Range and south to northern Ventura Co.: Red Mt., Mt. Hamilton Range, Santa Clara Co., *Elmer* 4877; upper San Benito River near Lorenzo Creek, *Jepson* 12,236; Stone Cañon, Monterey Co., *Condit;* Diablo Range, sw. Fresno Co., *Jepson* 15,394; Cuddy Valley (hill above), Mt. Piños, *Dudley & Lamb* 4503.

Tax. note.—The leaf-blades in this variety are deeply parted with broad rounded sinuses; whereas in the species the blades are merely pinnatifid with mostly shallow clefts either angular or acute. The capsule is narrowly ovate and very green; it is cylindric in the species and not green. The margins of the carpels are united by a narrow cartilaginous edge, which is not the case in the species. The seed is foveolate on one side, puncticulate on the other; whereas in the species it is foveolate on both sides. These various differences, in addition to the difference in hue of herbage, point somewhat towards specific status for this variety.

Refs.—EMMENANTHE PENDULIFLORA Benth., Trans. Linn. Soc. 17:281 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 439 (1901), ed. 2, 343 (1911), Man. 831, fig. 794 (1925). Var. ROSEA Brand; Engler, Pflzr. 4^{251}:134 (1913), type loc. Stauffer, Mt. Piños, *Hall* 6446.

9. **LEMMONIA** Gray

Small depressed annual with repeatedly dichotomous stems and alternate leaves. Flowers small, sessile, solitary in the lower forks and cymose-glomerate at the ends of the branches. Corolla narrowly bowl-shaped, without scales. Stamens short, included, abruptly dilated at base, the dilations joined by a very much reduced or lineate wing or margin. Ovary 1-celled, each placenta 2 or 3-ovuled. Styles 2, distinct to the base, short. Capsule membranous, 2-valved. Seeds 4, roughly pitted.—Species 1. (J. G. Lemmon, a pioneer botanical explorer of California.)

Note on relationships.—The tube of the corolla of Lemmonia californica is very short but distinctive and rather conspicuous. It is constricted at the top, at the point of stamen attachment. The bowl-shaped throat, markedly expanding above the tube, is twice as long as the tube. The ovary and capsule, described by Gray (Proc. Am. Acad. 12:162; Bot. Cal. 2:468) as 2-celled, are really 1-celled with closely parietal narrow placentae. In no way does Lemmonia differ in fruit from the species of Nama as a whole. Indeed, Lemmonia californica resembles Nama pusillum so closely that for the generic validity of Lemmonia one must look to the corolla character newly described above and to the peculiar structure joining the bases of the filaments. In all other essential respects, in habit, aspect, foliage, inflorescence and capsules, the similarity of Lemmonia californica to Nama pusillum is remarkable. Lemmonia as a genus rests mainly on two slight technical characters—that of the corolla-tube and the dilation-joined filaments.

1. **L. californica** Gray. Plants prostrate or diffuse, forming dense circular mats 3 to 9 inches broad; herbage puberulent; leaves rosulate at base, the blades spatulate, entire, 3 to 9 lines long, tapering into a short petiole; flowers solitary in the forks and crowded at the ends of the branches; calyx-lobes subfiliform or narrowly linear, densely white-hairy, in fruit twice the length of the capsule; corolla white, 5-lobed, 1¼ lines long, not exceeding the calyx-lobes; ovary densely hairy at summit; capsule slightly 2-lobed, 1 line long.

Shady spots or opens amongst brush, valley flats or mountain slopes, 2500 to 8200 feet: inner Coast Range from Lake Co. to southwestern Fresno Co.; Sierra Nevada in Kern Co.; Tehachapi Mts.; Mt. Piños region; north slope San Gabriel and San Bernardino mountains. South to Lower California. May-June.

Locs.—Inner Coast Range (stems markedly more slender than in S. Cal. plants): Mt. Konocti, Lake Co., *Jepson* 21,001; Mt. Hannah, Lake Co. (Engler, Pflzr. 4^{251}:138); betw. Glenbrook and Cobb Valley, Lake Co., *Carter* 346; Red Mts., near San Antonio Valley, Mt. Hamilton Range, *H. K. Sharsmith* 3619; Alcalde, sw. Fresno Co. (Zoe, 4:155). Sierra Nevada in Kern Co.: Walker Pass, *Purpus* 5722; Kernville, *T. Brandegee;* Erskine Creek, *Purpus* 5057. Tehachapi Mts.: Tehachapi, *K. Brandegee;* Fort Tejon, *Hall* 6286. S. Cal.: upper Lockwood Valley, Mt. Piños, *Hall* 6323; upper Sespe Creek, Ventura Co., *Munz* 13,229; Arrastre Creek, San Gabriel Mts., *Peirson* 396; Cajon Pass, *Peirson* 2421; Coxey Ranch, n. slope San Bernardino Mts., *Parish;* Bear Valley, San Bernardino Mts., *Hall.*

Refs.—LEMMONIA CALIFORNICA Gray, Proc. Am. Acad. 12:162 (1877), type collected by *Lemmon* on the headwaters of the Mohave River, n. slope San Bernardino Mts. (probably near Burcham ranch; not "Bear Creek,"—cf. Parish, Zoe 5:116); Jepson, Erythea 1:16 (1893), Man. 831 (1925).

10. **NAMA** L.

Low herbs. Leaves alternate, entire in ours (except N. rothrockii). Flowers purple, bluish or white, borne in terminal mostly dense clusters or cymes, or sometimes solitary in the axils. Calyx deeply 4 or 5-parted. Corolla funnelform, the tube without scales. Stamens included, commonly unequal and unequally inserted on the middle or lower part of the corolla-tube (or the insertion often only very slightly unequal). Styles 2, distinct, or united except at apex. Ovules 2 to 70 to each placenta. Capsule thin-walled, 2-celled (the 2 thin parietal placentae meeting in the axis) or incompletely 2-celled (the placentae only approximate), finally dehiscing into 2 entire valves (or in N. lobbii into 4 valves).—Species about 35, North and South America and Hawaiian Isls. (Greek nama, a spring.)

Leaves of one kind; stems herbaceous; capsule 2-valved.
  Leaves entire; annuals.
    Styles more or less connate.
      Ovary superior; leaves more or less petioled, not clasping; calyx-lobes linear, straight.—Subgenus CONANTHUS.
        Corolla 4½ to 7½ lines long; styles 3 lines long............................1. *N. aretioides.*
        Corolla 1⅛ to 2½ lines long; styles ¼ line long................................2. *N. densum.*
      Ovary half-inferior; leaves sessile, the upper clasping; calyx-lobes very narrow but spatulate-dilated at tip, in fruit accrescent, spreading or recurved at tip, the midnerve strongly thickened.—Subgenus ZONOLACUS.............................. 3. *N. stenocarpum.*

Styles distinct.—Subgenus NEONAMA.
Corolla campanulate, 4 to 6 lines long, its limb rather broad (the flowers somewhat showy).
Stems ascending; adnate portion of filaments not winged............4. *N. hispidum.*
Stems prostrate; adnate portion of filaments with a narrow margin or wing on each side..........5. *N. demissum.*
Corolla cylindric or salverform, 1½ to 2 lines long, its limb narrow (the flowers inconspicuous).
Leaf-blades ovate, 1 to 2½ lines long, abruptly attenuate into a petiole; stems prostrate..........6. *N. pusillum.*
Leaf-blades oblanceolate, about 2 to 6 lines long, gradually attenuate into a petiole; stems ascending or decumbent..........7. *N. depressum.*
Leaves sinuate-toothed; styles 2, distinct; perennial.—Subgenus ROTHROCKIA..........8. *N. rothrockii.*
Leaves of 2 kinds; main stems prostrate, woody at base; styles 2, distinct; capsule 4-valved.—Subgenus LOBBIA..........9. *N. lobbii.*

1. **N. aretioides** Brand. Stems 3 to 5 from the base, dichotomous, sparsely leafy, 1½ to 4½ inches long, forming a low broad plant, the terminal cymes dense, conspicuously leafy; leaves 6 to 8 lines long, the blades narrow-oblanceolate, narrowed to a petiolar base; fruiting calyx-lobes narrowly lanceolate or filiform-linear, hirsute, 3½ lines long, about 2½ times as long as the capsule; corolla purple or rose-red, tubular-funnelform, 4½ to 6 lines long; capsule narrow-elliptic, 1¼ lines long, each placenta about 10-seeded.

Sandy washes or flats, 3500 to 5000 feet: east of the Sierra Nevada from Inyo Co. to Sierra Co. East to Nevada, north to Washington. May-June.

Locs.—Mountain Spring Cañon, Argus Mts., *Purpus* 5029; Independence (w. of), Inyo Co., *Austin* 92; e. Sierra Co. (Univ. Cal. Publ. Bot. 4:225).

Var. **multiflorum** (Hel.) Jepson. Densely leafy; corolla funnelform, 6 to 7½ lines long, the limb much expanded.—Inyo Co. to Modoc Co. East to Nevada.

Locs.—Seven Pines, Inyo Co., *Mark Kerr* 114; Sherwin Hill, Mono Co., acc. *Peirson;* Honey Lake, Lassen Co., *Eisen;* Red Rock, Lassen Co., *Babcock & Stebbins* 1773; Fort Bidwell (Am. Jour. Bot. 20:421).

Refs.—NAMA ARETIOIDES Brand, Univ. Cal. Publ. Bot. 4:224 (1912). *Eutoca aretioides* H. & A., Bot. Beech. 374 (1840), type loc. betw. Burnt and Malheur rivers, Ore., *Tolmie;* Hook., Icon. Pl. t. 355 (1841). *Conanthus aretioides* Wats., Bot. King 256 (1871). *N. aretioides* f. *californicum* Brand, Univ. Cal. Publ. Bot. 4:225 (1912), type loc. e. Sierra Co., *Lemmon* 174. *N. aretioides* var. *californicum* Jepson, Man. 832 (1925). Var. MULTIFLORUM Jepson, Man. 832 (1925). *Conanthus multiflorus* Hel., Muhl. 2:238 (1906), type loc. Bishop, Inyo Co., *Heller* 8286. *N. aretioides* f. *multiflorum* Brand, Univ. Cal. Publ. Bot. 4:225 (1912).

2. **N. densum** Lemmon. Stems several from the base, prostrate, ascending or diffuse, 1 to 4 inches long, scantily leafy; herbage and calyx hispid or hispidulous; leaves 3 to 8 lines long, the blades oblanceolate, acute, gradually narrowed to a petiole; flowers in dense terminal very leafy clusters and solitary in the forks; calyx-lobes filiform-linear, 1½ to 2 times as long as the capsule; corolla purple or white, cylindric, 1⅛ to 2½ lines long; stamens very short (about ½ length of corolla-tube), inserted low in tube; styles very short (¼ line), united ¾ their length; capsule elliptic, 11 to 14-seeded; seeds black, angular, pitted.

Plateau plains or mountain slopes, 3000 to 11,700 feet: east and north sides of the Sierra Nevada from Inyo Co. to Modoc and Siskiyou Cos. East to Utah, north to Washington. Rather rare. May-July.

Locs.—Cottonwood Creek, w. Inyo Co., *Purpus* 1925; North Fork Crooked Creek, White Mts., *Jepson* 7275; Sherwin Hill, s. Mono Co., *Peirson* 12,421; upper Cottonwood Creek, Sweetwater Range, Mono Co., *Hoover* 5539; Bronco, e. Nevada Co., *Sonne* 480; Portola, Plumas Co., *K. Brandegee;* Shasta Valley, Siskiyou Co., *Jepson* 19,991.

Var. **parviflorum** C. L. Hitchc. Stems uniformly leafy, the leaves dark green, acute at apex.—Modoc Co.: Alturas (plains n.), *R. M. Austin.* Nevada to Utah and eastern Oregon and eastern Washington.

Refs.—NAMA DENSUM Lemmon, Bull. Torr. Club 16:222 (1889), type loc. Edgewood, Siskiyou Co., *Lemmon;* Jepson, Man. 832 (1925). *Conanthus densus* Lemmon; Hel., Cat. N. Am. Pl.

6 (1898). Var. PARVIFLORUM C. L. Hitchc., Am. Jour. Bot. 20:420 (1933). *Conanthus parviflorus* Greenm., Erythea 7:117 (1899), type loc. Malheur region, Ore., *Cusick* 1957.

3. **N. stenocarpum** Gray. Stems several from the base, diffuse, 3 to 11 inches long, mostly very leafy; herbage hirsute; leaf-blades oblanceolate to linear-oblong, sessile, ¾ to 2 inches long; flowers in leafy terminal clusters; calyx-lobes 1¼ to 1½ times as long as the capsule, divergent at the tips; corolla tubular, 3 to 3½ lines long, shorter than the calyx to 1⅓ times as long; capsule linear, 3 lines long, the seeds numerous.

Shores of lakes or ponds, 20 to 500 feet: cismontane Southern California from Los Angeles Co. to San Diego Co.; southern Colorado Desert. South to Lower California, east to Texas. Mar.-June.

Locs.—Cismontane S. Cal.: Sawtelle, near Santa Monica (Zoe 4:165); Anaheim Creek, Orange Co., *L. M. Booth* 1235; Sweetwater Valley, San Diego Co., *Cleveland.* Colorado Desert: Diamond Lake, Imperial Co., *T. Brandegee.*

Refs.—NAMA STENOCARPUM Gray, Proc. Am. Acad. 10:331 (1875), type from Tex., *Berlandier* 1095; Jepson, Man. 832 (1925). *Conanthus stenocarpus* Hel., Cat. N. Am. Pl. 6 (1898). *N. humifusum* Brand, Beiträge zur Kennt. der Hydrophyllaceae 9 (1911), type loc. Soldiers Home, Sawtelle, Los Angeles Co., *Hasse.*

4. **N. hispidum** Gray var. **spathulatum** C. L. Hitchc. Stems leafy, few to many from the very leafy base, ascending, 4 to 7 inches high; herbage hispid; leaves ½ to 1½ (or 2) inches long, the blades narrow-oblanceolate, gradually narrowed to base, not at all or scarcely petioled; flowers in loose or somewhat dense terminal clusters; calyx-lobes linear; corolla purple, 4 to 6 lines long; styles shorter than the calyx; ovules 20 to 50 to each placenta; capsule linear.

Sandy washes or valley floors, –50 to 500 feet: eastern Colorado Desert. East to Texas, south to Mexico. Mar.-Apr.

Flower note.—The stamen filaments are flattened or obcompressed with the edges standing at right angles to the corolla-tube. The stamens, inserted low on the corolla-tube, are nearly as long as the tube. The styles, though distinct to the base, are lightly connivent nearly to the top, with the tips spreading. The ovary bears a brush of hairs near the top.

Locs.—Palo Verde Valley, *Jepson* 5259 (it colonizes extensively the low river flats about Blythe); Chuckwalla Bench, *Hall* 5886.

Var. **revolutum** Jepson. Leaves linear, hirsute-hispid, ½ to ¾ line wide, the margin revolute.—Colorado Desert: Ripley, s. of Blythe, *Ferris* 7188; Fort Yuma, *Jepson* 11,731; Hayfields, Chuckwalla Valley, *Munz & Keck* 4931; Mecca, *Munz & Keck* 4740; Split Mt., *T. Brandegee;* Calexico, *Davy* 7965.

Refs.—NAMA HISPIDUM Gray, Proc. Am. Acad. 5:339 (1862), type from Tex., *Berlandier* 2385. Var. SPATHULATUM C. L. Hitchc., Am. Jour. Bot. 20:524 (1933). *N. biflora* var. *spathulatum* Torr., Pac. R. Rep. 7^3:17 (1856), type loc. Gila River, Ariz., *Antisell. N. hispidum* var. *coulteri* Brand; Engler, Pflzr. 4^{251}:154 (1913) in part; Jepson, Man. 832 (1925); not N. coulteri Gray, Proc. Am. Acad. 8:283 (1870). Var. REVOLUTUM Jepson, Man. 832 (1925), type loc. Pilot Knob, Colorado River, *J. Grinnell.*

5. **N. demissum** Gray. Stems prostrate and mat-like, 1 to 6 inches long; herbage hirsutulous-pubescent; leaves ½ to 1¼ inches long, linear-oblanceolate, gradually attenuate to a petiole; flowers in terminal clusters; calyx-lobes narrowly linear; corolla bright red-purple, 5 to 6 lines long; filaments unequal and unequally inserted, their adnate bases with somewhat free margin; ovary with a brush of hairs at summit; capsule 8 to 14-seeded.

Sandy desert flats, washes and mesas, –50 to 5000 feet: east side of the Sierra Nevada in Mono and Inyo Cos.; Sierra Nevada in Kern Co.; Mohave and Colorado deserts; Cuyamaca Mts., eastern San Diego Co. South to Lower California, east to Utah and Arizona. Apr.-May. A lowly but showy and frequent plant almost throughout the California deserts.

Locs.—Mono and Inyo Cos.: Milner Creek, White Mts., Mono Co., *Duran* 3239; Bishop (foothills w.), *Almeda Nordyke;* Alabama Hills, *Renner* 29; Furnace Creek, Funeral Mts., *Jepson* 6919. Sierra Nevada in Kern Co.: Weldon, *Voegelin* 83. Mohave Desert: Needles, *Ruby I. Warner;* Leastalk, Ivanpah Valley, *Sumner & Grinnell;* Newberry (lava sw. of), *Newlon* 510; Calico Wash,

w. of Calico Mts., *Jepson* 6696; Barstow, *Jepson* 5367; Jim Grey sta., *Jepson* 15,565; Kramer, *Jepson* 18,376; Lancaster (6½ mi. w.), *Jepson* 17,051; Little Rock Creek, n. slope San Gabriel Mts., *Peirson* 2415. Colorado Desert: Chuckwalla Bench, *Schellenger;* Cottonwood Spr., Eagle Mts., *Jepson* 12,548; Andreas Cañon, Mt. San Jacinto, *Newlon* 447; Palm Cañon of San Ysidro, *C. V. Meyer* 58; Vallecito, e. San Diego Co., *Jepson* 8577; Cuyamaca Mts., *Newlon* 362.

Refs.—Nama demissum Gray, Proc. Am. Acad. 8:283 (1870); type loc. deserts of Nevada, *Fremont;* Jepson, Man. 832 (1925). *Marilaunidium demissum* Ktze., Rev. Gen. Pl. 2:434 (1891). *Conanthus demissus* Hel., Cat. N. Am. Pl. 6 (1898). *N. demissum* var. *deserti* Brand; Engler, Pflzr. 4^{251}:159 (1913), type loc. Victorville, Mohave Desert, *Grinnell;* C. L. Hitchcock, Am. Jour. Bot. 20:531 (1933). *N. demissum* var. *covillei* Brand, l.c., type loc. Funeral Mts., *Coville & Funston* 453; leaf-blades rhombic-obovate. *N. demissum* var. *lineare* C. L. Hitchc., Am. Jour. Bot. 20:531 (1933), type loc. San Gregorio, L. Cal., *T. Brandegee;* leaves linear, calyces grayish-pilose.

6. **N. pusillum** Lemmon. Stems 3 to 5 from the base, prostrate, leafy, dichotomously branching, ½ to 2¾ inches long, ending in cymose flower-clusters; herbage hirsute-pubescent; leaf-blades broadly ovate, 1 to 2½ lines long, rather abruptly contracted into a petiole nearly or quite as long; calyx-lobes linear, densely hirsute; corolla white, cylindric with narrow abrupt limb, 1½ to 1¾ lines long; capsule elliptic, 1⅛ lines long, the cells 8 to 16-seeded.

Stony desert mesas, 500 to 5000 feet: Inyo Co.; Mohave Desert; eastern Colorado Desert. Apr.-May.

Locs.—Inyo Co.: Emigrant Cañon, Death Valley, *Parish* 10,192. Mohave Desert: Amboy Crater, *Jepson* 20,321; Baker (15 mi. n.), *Peirson* 9954; Ludlow, *Hall* 6110; Paradise Mts. (4 mi. ne.), *Jepson* 17,253; Calico, *Parish* 9809; Kramer, *K. Brandegee.* Colorado Desert: Mule Sprs., e. Riverside Co., *Hall* 5963.

Refs.—Nama pusillum Lemmon; Gray, Proc. Am. Acad. 20:305 (1885), type loc. Fort Mohave, se. border of Cal., *Lemmon;* Jepson, Man. 833 (1925). *Conanthus pusillus* Lemmon; Hel., Cat. N. Am. Pl. 6 (1898).

7. **N. depressum** Lemmon. Stems 3 to 8, decumbent or ascending from the basal rosette of leaves, naked or nearly so below the leafy dichotomous cyme, 1 to 3½ inches long; herbage puberulent; leaf-blades linear-oblanceolate, 2 to 6 lines long, gradually attenuate into a petiole 1 to 4 lines long; calyx-lobes linear, thinly hirsute-ciliate; corolla white, cylindric with narrow border, 1½ to 2 lines long, its lobes crenulate, the lower one with 2 dots; capsule oblong, 1¼ to 1½ lines long, the cells about 8 to 12-seeded.

Sandy desert flats or mesas, 2000 to 4000 feet: Inyo Co.; Sierra Nevada in Kern Co.; central and eastern Mohave Desert. May-June.

Locs.—Inyo Co.: Independence, *Hall & Chandler* 7293. Sierra Nevada in Kern Co.: Kernville, *T. Brandegee.* Mohave Desert: Rabbit Sprs. (Am. Jour. Bot. 20:533); Barstow, *Jepson* 5424; Calico, *Lemmon* 3136; Amboy, *Curran.*

Refs.—Nama depressum Lemmon; Gray, Proc. Am. Acad. 20:304 (1885), type loc. "se. borders of Cal. in the Mohave Desert near Fort Mohave," *Lemmon* (Fort Mohave is in Arizona on the Colorado River); Jepson, Man. 833 (1925). *Conanthus depressus* Lemmon; Hel., Cat. N. Am. Pl. 6 (1898).

8. **N. rothrockii** Gray. Stems erect, simple, several from the branched root-crown of a deep-seated perennial root, 6 to 8 inches high; herbage glandular-pubescent, the stems, petioles and especially the calyx with spreading bristles; leaves somewhat thick, the blades narrowly oblong, regularly sinuate-dentate, 1 to 1⅝ inches long, sessile or nearly so; flowers numerous in a dense terminal head, the heads globose, 1½ to 1¾ inches broad; calyx-lobes narrowly linear, 4 to 5 lines long; corolla lavender, 6 to 7½ lines long; ovary and lower part of styles hispidulous; styles distinct; capsule 4 to 20-seeded, the seeds minutely reticulate-pitted.

Sandy meadows or flats, 6500 to 10,000 feet: Sierra Nevada, east side in Mono and Inyo Cos.; upper Kern River basin in the southern Sierra Nevada; San Bernardino Mts. June-July.

Field note.—Nama rothrockii multiplies by running rootstocks and tends to form colonies in sandy flats. The parts of the perianth and androecium, normally 5, are often 6 or 7.

Locs.—Sierra Nevada (east side); Mammoth (road to), w. Mono Co., *Kennedy;* Andrews Camp, upper Bishop Creek, *K. Brandegee;* betw. Hockett Trail summit (near Wonoga Peak) and

Little Cottonwood Creek, w. Inyo Co., *Jepson* 945a. Upper Kern River basin, Tulare Co.: Junction Mdw. (near), Kern-Kaweah River, *A. J. Perkins;* Mt. Whitney, *Kellogg;* Volcano Creek, *Jepson* 4929; Big Arroyo, *Culbertson* 4682; Little Kern River near Deep Creek, *Jepson* 4911; Olancha Mt., *Hall & Babcock* 5262. San Bernardino Mts. (northerly side): Holcomb Valley, *Parish.*

Refs.—NAMA ROTHROCKII Gray, Bot. Cal. 1:621 (1876), type loc. South Fork Kern River, *Rothrock;* Jepson, Man. 833 (1925). *Marilaunidium rothrockii* Ktze., Rev. Gen. Pl. 2:434 (1891). *Conanthus rothrockii* Hel., Cat. N. Am. Pl. 6 (1898).

9. **N. lobbii** Gray. (Fig. 407.) White-woolly plant: stems creeping, woody, bearing many ascending branches 3 to 8 inches long; leaves entire, of 2 kinds, those of the vegetative shoots rather crowded, dark green, their blades linear or narrow-oblanceolate, more or less revolute, $\frac{3}{4}$ to 1 inch long, sessile, with a short branchlet or dense fascicle of smaller leaves in the axils: leaves of the flowering shoots scattered, their blades oblanceolate to spatulate, white-woolly beneath, densely villous above, 1 to $2\frac{1}{4}$ inches long, narrowed to base but scarcely petioled; flowering shoots bearing sessile or shortly peduncled clusters of flowers in their uppermost axils; calyx-lobes narrowly linear, $\frac{1}{2}$ as long as corolla; corolla purple, narrow-funnelform, 4 to 5 lines long; ovary densely and style somewhat hairy: ovules 2 to 8 to each placenta; capsule 4 to 14-seeded, the seeds large ($\frac{3}{4}$ line long), densely papillate.

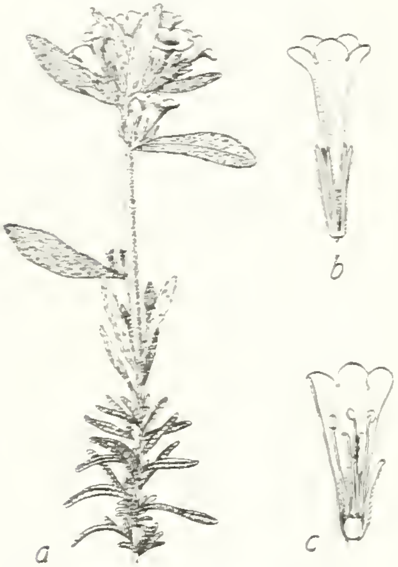

Fig. 407. NAMA LOBBII Gray. *a*, fl. branchlet, × $\frac{2}{3}$; *b*, fl., × $1\frac{2}{3}$; *c*, long. sect. of fl., × $1\frac{2}{3}$.

Rocky, sandy or red-volcanic soil of slopes and ridges, 4000 to 7000 feet: North Coast Ranges in Trinity Co. and southwestern Siskiyou Co.; northern Sierra Nevada from Eldorado Co. to Shasta Co. East to western Nevada. June-July.

Morphological note.—The leafy shoots or branchlets are of two kinds, vegetative shoots and flowering shoots. The vegetative shoots bear glandular and dark green narrow leaves. The flowering shoots arise terminally the next year from the vegetative branchlets and bear whitish leaves that are of a different shape and are broader. The two types of foliage shoots thus appear in regular alternation. The running rootstocks, 1 to several feet long, give rise to colonies.

The corolla-tube is angled in full anthesis, in the bud it is deeply grooved outside opposite the corolla sinuses (between the rounded angles of the tube). In these grooves of the corolla-tube the slender calyx-lobes lie. The included stamens, 3 long and 2 short, are adnate at base of corolla-tube for 1 line, the adnate part of the filament strongly in relief and very narrowly winged on both sides. The capsule is first loculicidally, then septicidally dehiscent, which is a character of the genus Eriodictyon. This species is, thus, a connecting link between Nama and Eriodictyon and on technical grounds rests about as well in one genus as the other.

Locs.—North Coast Ranges: North Fork Coffee Creek, Salmon Mts., n. Trinity Co., *Alexander & Kellogg* 242; Castle Lake to Mt. Bradley, Trinity Mts., sw. Siskiyou Co., *Condit.* Sierra Nevada: betw. Emerald Bay and Tallac, Lake Tahoe, *Ottley* 1197; Sardine Lake, Sierra Co., *Hall & Babcock* 4490; Jonesville, Butte Co., *Copeland* 448; Spanish Peak, Plumas Co., *Jepson* 19,314; Lassen Peak, *Chesnut & Drew;* Fowlers Camp, McCloud River, se. Siskiyou Co., *Jepson* 20,071; Mt. Shasta, *Jepson* 21,002.

Refs.—NAMA LOBBII Gray, Proc. Am. Acad. 6:37 (1866), type from Cal., *Lobb* 105 (undoubtedly in the Sierra Nevada, most probably in Placer Co. or Nevada Co.); Jepson, Man. 833, fig. 795 (1925). *Eriodictyon lobbii* Greene, Bull. Cal. Acad. 1:202 (1885). *Marilaunidium lobbii* Ktze., Rev. Gen. 2:434 (1891). *Conanthus lobbii* Hel., Cat. N. Am. Pl. 6 (1898).

11. ERIODICTYON Benth.

Shrubs, or one more or less herb-like, mostly with aromatic herbage. Leaves alternate, pinnately veined, usually finely reticulated (especially beneath), coriaceous or firm, mostly dentate and petiolate. Flowers in a terminal, usually naked, panicle of scorpioid cymes (or the panicle sometimes condensed into a head). Calyx-lobes narrowly linear, not dilated above. Corolla funnelform to campanulate, its tube without scales. Stamens little or not at all exserted, unequal or sometimes subequal, mostly unequally inserted at middle of corolla-tube or below, the filaments sparsely hirsute, their adnate portion (below insertion) usually in relief on the tube. Ovary nearly or quite 2-celled by the meeting of the protruded plate-like placentae in the axis; styles 2, distinct. Capsule small (1 to 2 lines long), both loculicidal and septicidal, thus 4-valved, each valve with a short beak or acumination, each closed on one side by the adherent half-partition and usually 1 or 2 (rarely 3)-seeded.—Species 11, western North America. (Greek erion, wool, and diktuon, a net, by reason of the netted woolly under surface of the leaves.)

- Shrubs; herbage aromatic; corolla regular.—Subgenus NEOMACBRIDEA.
  - Leaves glutinous, glabrous above or nearly so or at most pubescent.
    - Panicle or cyme open, branched.
      - Leaves usually toothed, not revolute, mostly oblong.
        - Calyx sparsely hirsute; corolla thinly puberulent outside; cent. and n. Cal.......... 1. *E. californicum.*
        - Calyx densely white-hairy; corolla markedly pubescent outside; mts. of S. Cal. 2. *E. trichocalyx.*
      - Leaves mostly entire, revolute-margined, narrowly linear; e. Mohave Desert.............. 3. *E. angustifolium.*
    - Panicle congested into a small head; leaves very narrowly linear, entire, strongly revolute; Purisima Hills, Santa Barbara Co...4. *E. capitatum.*
  - Leaves white-tomentose (or usually so) on both surfaces.
    - Corolla-throat open, the lobes gradually spreading; calyx densely white-hairy, not glandular; capsule 2 lines long; intramontane and cismontane S. Cal......................... 5. *E. crassifolium.*
    - Corolla constricted or not expanded at throat, the lobes abruptly spreading; calyx hairy and glandular; capsule 1 line long.
      - Calyx densely white-hairy throughout; corolla 1½ lines long; stems densely white-tomentose; South Coast Ranges...6. *E. tomentosum.*
      - Calyx dark-colored, thinly hairy on the upper half of the lobes, the lower half of the lobes merely ciliate; corolla 3 to 4 lines long; stems thinly tomentose; coastal San Luis Obispo and Santa Barbara Cos. and Catalina Isl............... 7. *E. traskiae.*
- Herb-like, the tall erect stems woody only at base; herbage hirsute, ill-scented; corolla slightly irregular; montane southward.—Subgenus TURRICULA...8. *E. parryi.*

1. **E. californicum** Greene. YERBA SANTA. CALIFORNIA MOUNTAIN BALM. (Fig. 408.) Shrub 2 to 8 feet high; leaf-blades oblong to lanceolate, 2½ to 6 inches long, ½ to 1 inch wide, dentate except at base or below the middle, very glutinous-resinous on upper surface, as if varnished, the areas between the veins and cross-veinlets on the under surface with a close dense felt; petioles about ½ inch long; panicle 3 to 10 inches long; calyx 1 line long; corolla white or lavender, tubular-funnelform, 5 to 7 lines long; stamens unequal and unequally inserted above the middle of the corolla-tube, these and the styles included; ovules 3 (or 2) to each margin of a placenta; capsule 2 to 8-seeded.

Dry mountain slopes and ridges, 500 to 5500 feet, frequent and often abundant and gregarious over extensive areas: Coast Ranges from San Benito and Monterey Cos. to Del Norte Co. and western Siskiyou Co.; Marysville Buttes; Sierra Nevada from Kern Co. to eastern Siskiyou Co. North to southern Oregon. May-June.

Biol. note.—Eriodictyon californicum, one of the more widespread and abundant shrubs in California, is most commonly met with in the chaparral as an associate of Adenostoma fasciculatum, Ceanothus cuneatus, Rhus diversiloba, Garrya fremontii, Rhamnus crocea var. ilicifolia, Pickeringia montana, Arctostaphylos manzanita and A. viscida, Dendromecon rigidum and Quercus durata. Occasionally it appears as pure colonies of several score or several hundred acres, especially on ridges where the clay soil, steepness of slope and certain drainage give it an advantage. Such colonies may be observed on the south slope of Mt. Tamalpais, on Howell Mt., and on the ridge westerly from Witter Sprs. in northwestern Lake Co. In many such cases it is the major or exclusively successional species after repeated fire clearance of chaparral terrains.

Bushes crown-sprout freely after chaparral fires. There is also free reproduction by seed, especially on "burns" where seedlings may make extremely dense stands. The leaves of seedlings are oblong-ovate and broader than the adult leaves. Where seedings are well spaced on fertile "burns," the blades of leaves may become remarkably large: 10 to 12 inches long and 3½ to 4½ inches wide (cf. Columbia, Tuolumne Co., *Jepson* 6446). Rarely the leaves on fertile shoots may be broadly oblong and 5 to 6 inches long. The species has marked vitality, is aggressive in its territory and is one of the first of chaparral species to reoccupy cleared or pastured lands.

In the California Black Oak belt of the Sierra Nevada between Mariposa and the San Joaquin River, Eriodictyon californicum is frequent and sometimes forms extensive colonies. It seems in this part of the range largely to replace Adenostoma fasciculatum. Eriodictyon californicum may also occur on the floors of montane valleys as in Indian Valley, northeastern Lake Co.

The lobes of the corolla are a little revolute at the sides. The pubescent ovary is seated on a deep-yellow disk. The adnate portion of the filaments is narrowly 2-winged.

In the Tulare County foothills the dried leaf is smoked by settlers or mixed with smoking tobacco; it is also chewed separately. Sometimes one finds colonies of shrubs whose leaves are heavily blackened by a sooty mold (conidial fungus).

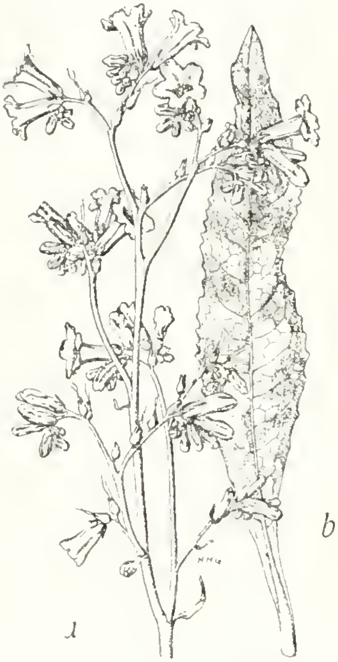

Fig. 408. ERIODICTYON CALIFORNICUM Greene. *a*, fl. branchlet, × ⅔; *b*, leaf, × ⅔.

Locs.—Coast Ranges: Zapato Chino Creek, Diablo Range, sw. Fresno Co., *T. Brandegee;* San Benito Peak, San Carlos Range, *Jepson;* Lorenzo Creek, s. San Benito Co., *Jepson* 20,242; Cruickshank Creek, Santa Lucia Mts., s. Monterey Co., *Condit;* Little Arthur Creek, w. of Gilroy, *Jepson* 9678; Big Basin, Santa Cruz Mts., *Howell* 3030; Cedar Mt., Mt. Hamilton Range, *Jepson;* Las Trampas Ridge, Contra Costa Co., *Jepson;* Mt. Diablo, *Jepson;* Mt. Tamalpais, *Jepson* 5721; Collins Camp, Vaca Mts., *Jepson* 21,005; Rumsey (n. of), w. Yolo Co., *Jepson;* Knoxville Ridge, se. Lake Co., *Jepson* 18,997; Houghs Sprs., ne. Lake Co., *Jepson* 9022; Venado (valley above), sw. Colusa Co., *Jepson;* Walker Valley, s. of Willits, *Jepson;* Red Mt., nw. Mendocino Co., *Jepson;* Grasshopper Peak, at head of Canoe Creek, Humboldt Co., *Constance* 887; Rosewood, w. Tehama Co., *Jepson;* Hupa Valley, *Chandler* 1352; Castle Rock sta., Shasta Co., *Jepson;* Yreka, *Butler* 1405; Gasquet, Del Norte Co., *Tracy* 9374. Marysville Buttes: North Butte, *Ewan* 9592. Sierra Nevada: Erskine Creek, Kern Co., *Purpus* 5559; betw. Springville and Nelsons, Tule River, *Jepson;* betw. Dunlap and Pinehurst, Fresno Co., *Newlon* 149; Cressman School, Pine Ridge, Fresno Co., *Jepson;* betw. Northfork sta. and San Joaquin River bridge, Madera Co., *Jepson;* Chowchilla School, Mariposa Co., *Jepson;* Mormon Bar, Mariposa Co., *Jepson* 12,772; Snow Creek, Yosemite, *Jepson;* Groveland, s. Tuolumne Co., *Jepson* 10,432; Hetch Hetchy, *Jepson;* betw. Gold Spr. and Parrott Ferry, n. Tuolumne Co., *A. L. Grant* 82a; Gwin Mine, Calaveras Co., *Jepson* 1775; Ione (e. of), Amador Co., *Jepson;* Auburn, *Shockley;* Shoo-fly Bridge, Plumas Co., *R. M. Austin* 450; betw. Payne Creek and Mineral, Tehama Co., *J. Grinnell;* Redding, *Blankinship;* Hawkinsville, Siskiyou Co., *Jepson* 19,975.

Refs.—ERIODICTYON CALIFORNICUM Greene, Pitt. 2:23 (1889); Jepson, Fl. W. Mid. Cal. 440 (1901), ed. 2, 343 (1911), Man. 834, fig. 796 (1925). *Wigandia californica* H. & A., Bot. Beech. 364, t. 88 (1840), type from Cal., *Douglas. E. glutinosum* Benth., Bot. Sulph. 36 (1844), a new name for the preceding. *E. californicum* subsp. *glutinosum* Brand; Engler, Pflzr. 4^{251}:141 (1913). *E. glutinosum* var. *serratum* Choisy; DC., Prodr. 10:183 (1846), type from Cal., *Douglas. E. californicum* f. *lineare* Brand, Univ. Cal. Publ. Bot. 4:224 (1912), type loc. Yreka, *Heller* 7996. *E. californicum* f. *latifolium* Brand; Engler, Pflzr. 4^{251}:141 (1913), based on type of species.

2. **E. trichocalyx** Hel. YERBA YNEZ. Shrub 2 to 4 feet high; leaf-blades narrow-oblong to linear, dentate except on lower part, green and glandular and puberulent above or glabrous, densely felt-like beneath in the interstices of the venation, 2 to 3 inches long, narrowed to a short (¼ to ½ inch) petiole; inflorescence distinctly cymose rather than paniculate; calyx densely white-hairy; corolla narrow-campanulate, 3 to 4½ lines long, markedly pubescent outside; filaments unequally inserted below middle of corolla-tube, the adherent portion hairy and narrowly winged at base; capsule about 4-seeded.

Mesas and dry stream beds of chaparral belt, 1200 to 6500 feet: mountain ranges of Southern California from the Santa Ynez Mts. to the San Gabriel and San Bernardino mountains and their desert (transmontane) borders or valley (cismontane) flats. Apr.-June.

Locs.—Santa Ynez Mts., *Dunn;* Pine Mt., nw. Ventura Co., *Jepson* 20,214; Castaic Creek (mts. above), n. Los Angeles Co., *Jepson* 8932; Mt. Lowe, San Gabriel Mts., *Peirson* 169; Icehouse Cañon, San Antonio Mts., *Parish* 11,979; Cajon Pass, *Epling;* Victorville, Mohave Desert, *Hall* 6188; Cactus Flats, desert slope San Bernardino Mts., *Munz* 10,510; Fish Creek, San Bernardino Mts., *J. Grinnell* 52; San Bernardino Valley, *Parish* 11,410; Banning, *T. Brandegee;* Indian Wells, Coachella Valley, nw. Colorado Desert, *Clary* 1030.

Var. **lanatum** (Brand) Jepson. Leaf-blades yellow-green above, clothed with a shining white felt beneath.—Santa Rosa Mts. (western Riverside Co.) to the Laguna Mts. (eastern San Diego Co.): Santa Rosa Mts. (Santa Rosa Village, *Duran* 3489); San Diego Co. (Indian Cañon, Collins Valley, *Jepson* 8861; Palm Cañon of Mt. San Ysidro, *C. F. Meyer* 62; Mason Valley, *H. A. Dutton;* Laguna Mts., *T. Brandegee;* Descanso, *C. M. Wilder;* Campo, *T. Brandegee;* Jacumba, *Johansen & Ewan* 7154).

Refs.—ERIODICTYON TRICHOCALYX Hel., Muhl. 1:108 (1904), type loc. Seven Oaks, San Bernardino Mts., *Geo. B. Grant;* Jepson, Man. 834 (1925). *E. angustifolium* Nutt. var. *pubens* Gray, Proc. Am. Acad. 17:224 (1882), type loc. "San Bernardino Co.," *S. B. & W. F. Parish. E. californicum* subsp. *australe* var. *pubens* Brand; Engler, Pflzr. 4^{251}:142 (1913). Var. LANATUM Jepson, Man. 834 (1925). *E. californicum* subsp. *australe* var. *lanatum* Brand, l.c., type loc. betw. Campo and Jacumba, San Diego Co., *Abrams* 3632. *E. lanatum* Abrams & Smiley, Bot. Gaz. 60:126 (1915).

3. **E. angustifolium** Nutt. Shrub 2 to 3 feet high, the branchlets rather densely clothed with leaves; leaf-blades narrowly linear, entire or dentate, light green and glabrous or nearly so above, white-tomentose beneath, narrowed towards the base but scarcely petioled, 2 to 3½ inches long; panicle 2½ to 6 inches long; calyx sparsely hirsutulous, 1 to 1½ lines long; corolla white, narrowly campanulate, 2 to 3 lines long.

Dry slopes, 4000 to 6000 feet: New York Mts., eastern Mohave Desert. East to Utah, south to Lower California. May-Aug.

Distrib. note.—In southern Nevada, in southern Utah and in Arizona Eriodictyon angustifolium is frequently met with in mountain ranges and extends into Lower California at least as far south as San Pedro Martir. In California the occurrence of this species is probably of limited extent, since it is known thus far only in Keystone Cañon, New York Mts. (*Wolf & Everett* 9025).

Refs.—ERIODICTYON ANGUSTIFOLIUM Nutt., Jour. Acad. Phil. ser. 2, 1:181 (1848), type loc. "Sierra of Upper California," undoubtedly Arizona, since Arizona is the only region where this species is found on the route traversed by Gambel, the original collector of it; Gray, Syn. Fl. ed. 2, 2:176 (1886).

4. **E. capitatum** Eastw. Shrub; leaves fascicled toward ends of branches, the blades narrowly linear, with strongly revolute margins, sessile, 1½ to 2 inches long; peduncles slender, not exceeding the subtending leaves, terminating in a densely congested small (¾ inch wide) flower-cluster; calyx villous; corolla lavender, 4 lines long, villous, the upper part of the lobes glabrous; filaments unequally inserted below the middle of the corolla-tube, the adherent part narrowly winged at base.

Brushy ravines, 100 to 500 feet: Purisima Hills, north side of lower Santa Ynez River valley, near the ocean, Santa Barbara Co. May-Aug.

Endemism note.—Eriodictyon capitatum is an entirely peculiar species of the narrow endemic category which is restricted to a very limited area on the Burton mesa, west end of the Purisima Hills. The original area where it is found probably does not exceed a diameter of two or three miles and lends to this singular Eriodictyon a special interest. The following collections are cited: Pine Cañon, Burton Mesa, *Rowe;* ravine approaching Burton Mesa, *McMinn* 4347. Very recently a station has been discovered in Cojo Cañon acc. *M. Van Rensellaer.*

Ref.—ERIODICTYON CAPITATUM Eastw., Lflts. West. Bot. 1:40 (1933), type loc. Lompoc (5 mi. n.), on road to Casmalia, Santa Barbara Co., *Hoffmann.*

5. **E. crassifolium** Benth. YERBA BLANCO. Bluish-gray shrub, 4 to 6 (or 12) feet high; herbage covered with a dense felt-like tomentum, the young leaves often snow-white, at maturity usually dull or greenish; leaf-blades oblong to oval, felt-like, thick and rigid, crenate, 2 to 4 inches long; petioles about ¼ inch long; panicle

roundish or flat-topped, 1½ to 3½ (or 5) inches broad; calyx densely villous, ⅓ to ½ as long as the villous corolla; corolla funnelform (with expanded throat), pale lavender to rose pink, 4 to 6½ lines long; filaments unequally inserted below the middle of corolla-tube, adherent below insertion, the adherent portion hairy and narrowly winged; capsule densely white-hairy, about 8 to 12-seeded; seeds finely striate-reticulate.

Gravelly or rocky ground of stream beds and washes in and bordering the mountains, 50 to 6000 feet: cismontane Southern California from the Mt. Piños region of southwestern Kern Co. to San Diego Co. Apr.-June.

Locs.—San Emigdio Potreros, near Mt. Piños, sw. Kern Co., *Hall* 6391; Sespe Creek, Ventura Co., *Munz* 9366; Ojai Valley, Ventura Co., *Thacher* 38; Echo Mt., San Gabriel Mts., *Peirson* 171; Reche Cañon, se. of San Bernardino, *Parish* 2645; Murray Cañon, San Jacinto Mts., acc. *Peirson;* Orange Park, Santiago Cañon, Santa Ana Mts., *Alice King;* San Jacinto River, San Jacinto Valley, *Jepson* 1257a; Dripping Spr., 3 mi. westerly from Nigger Valley, sw. Riverside Co., *Jepson* 19,213; La Jolla, San Diego Co., *Jepson* 11,838.

Note on variations.—In most respects Eriodictyon crassifolium is constant or fairly uniform in its characters save in thickness of tomentum on the upper side of the leaf, in hue of leaf and in breadth of leaf. In var. DENUDATUM Abrams the leaves are narrower (6 to 8 lines wide), green and thinly pubescent above. This form occurs in southwestern Kern Co. (San Emigdio Cañon, *Davy* 2026) and occurs frequently in Ventura Co. (Mt. Piños, *Hall* 6587; lower Sespe Creek, *Epling & Ellison;* Wheeler Hot Sprs., *Munz* 13,158). But the broad-leaved form may also exhibit leaves green and densely pubescent above (not tomentose) as at Ramona, San Diego Co., *K. Brandegee.* The var. NIGRESCENS Brand, of the same region as var. denudatum, also narrow-leaved, differs from var. denudatum only in its darker leaves and dark or black calyces (Frazier Mt., *Jones* 28,584; San Francisquito Cañon, Los Angeles Co., *Hall & Chandler* 7400; Sand Creek, Los Angeles Co., *Parish* 1907). Both forms may occur sporadically as far south as San Diego Co. Conversely, narrow-leaved forms may be densely white-tomentose above as in the usual broad-leaved form.

Refs.—ERIODICTYON CRASSIFOLIUM Benth., Bot. Sulph. 35 (1844), type loc. San Diego, *Barclay;* Curran, Bull. Cal. Acad. 1:201 (1885); Jepson, Man. 834 (1925). *E. tomentosum* of many authors, not Benth. (1844). *E. crassifolium* subsp. *grayanum* and var. *typicum* Brand; Engler, Pflzr. 4^{251}:139 (1913). Var. NIGRESCENS Brand; Engler, Pflzr. 4^{251}:140 (1913), type loc. Acton, Los Angeles Co., *Elmer* 3596. Var. DENUDATUM Abrams, Bot. Gaz. 60:129 (1915), type loc. Red Reef Cañon, Topatopa Mts., Ventura Co., *Abrams & McGregor* 159.

6. **E. tomentosum** Benth. YERBA LUCIA. Widely branched shrub 3 to 8 feet high; stems and leaves of adult or flowering shoots and the panicle branches covered with a thick white felt; juvenile shoots green, glandular and often subglabrous; leaf-blades elliptic or ovate to oblong, 1½ to 6 inches long, dentate or crenate, borne on short (2 to 6 lines) petioles; flowers in a widely branched panicle 4 to 13 inches long, the branches terminating in small dense cymes; calyx densely white villous, concealing the glandular hairs beneath; corolla white, urnshaped, 1½ lines long, constricted at throat, the short lobes spreading or recurving; stamens subequally inserted at middle of corolla-tube, the filaments not in relief below insertion; capsule densely hairy on upper half, about 10 to 12-seeded; seeds smoothish but minutely punctate.

Dry slopes and summits, 300 to 5800 feet: South Coast Ranges back of the coast from Monterey Co. to western Fresno Co. and San Luis Obispo Co. June-July.

Field note.—The diversity of leaf-size and differences in amount and character of pubescence on an individual are characteristic marks of Eriodictyon tomentosum. The leaves of ordinary or flowering shoots are usually about 2 to 4 inches long and clothed on both surfaces with a dense tomentum which is often silvery white (the form E. niveum Eastw.), the stems and branches of the inflorescence being similarly white-tomentose. The juvenile shoots from the lower part of the shrub, on the contrary, present a marked contrast to the adult foliage. The leaves are usually much larger (6 to 7½ inches long and 2¾ to 3½ inches wide), green on both surfaces and only microscopically puberulent. The branches of the cymes are densely set with small corollas which are freely worked by the honey bee.

Locs.—Tassajara Hot Sprs., n. Monterey Co., *Cox;* Santa Lucia Peak, Santa Lucia Mts., *Jepson* 4735; Jolon, *K. Brandegee;* Bear Valley, San Benito Co., *Jepson;* Lewis Creek, San Benito Co., *Jepson;* Stone Cañon, se. Monterey Co., *Jepson* 15,918; Cholame Hills (w. of Parkfield), Monterey Co., *Jepson* 19,259; Vineyard Cañon, ne. of San Miguel, *Jepson;* Idria, San Benito Co.; Los Gatos Creek, San Carlos Range, *Jepson* 12,176; Zapato Chino Creek, Diablo Range, *Jepson;* Cholame, e. San Luis Obispo Co., *Lemmon;* Pozo Range, s. San Luis Obispo Co., *Jepson* 11,988.

Refs.—ERIODICTYON TOMENTOSUM Benth., Bot. Sulph. 36 (1844), type from Cal., *Douglas;* Curran, Bull. Cal. Acad. 1:201 (1885). *E. niveum* Eastw., Proc. Cal. Acad. ser. 3, 1:130 (1898), type loc. Jolon, *Eastwood*. *E. crassifolium* subsp. *benthamianum* Brand var. *niveum* Brand; Engler, Pflzr. 4^{251}:140, fig. 26 (1913). *E. crassifolium* var. *niveum* Jepson, Man. 834 (1925).

7. **E. traskiae** Eastw. YERBA DAMA. Shrub 2 to 4 feet high, similar in aspect to E. tomentosum, the tomentum on the stems thinner; leaf-blades ovate-elliptic to broadly oblong, crenate to sinuate or subentire, greenish and densely pubescent above, white-tomentose beneath, 1¼ to 5 inches long; cymes denser and usually fewer in the panicle than in E. tomentosum, the inflorescence, therefore, rather small; calyx-lobes narrow-linear, dark and glandular-ciliate; corolla blue, the tube 3 lines long, constricted at the throat, the lobes abruptly spreading, about 1 line long; stamens unequally inserted on lower part of corolla-tube, the filaments short, not in relief below point of insertion; styles not exserted from corolla; capsule 4-seeded.

Brushy hills, 100 to 3500 feet: coastal ranges in San Luis Obispo and Santa Barbara Cos.; Santa Catalina Isl. May-June.

Locs.—San Luis Obispo Co.: Santa Lucia Mts., *Condit* 21. Santa Barbara Co.: Purisima Hills, *Jepson* 11,956; Painted Cave ranch, Santa Ynez Mts., *Eastwood* 121; near Santa Barbara, *T. Brandegee*. Santa Catalina Isl.: Whites Ldg., *Abrams & Wiggins* 324; Avalon, *Trask*.

Refs.—ERIODICTYON TRASKIAE Eastw., Proc. Cal. Acad. ser. 3, 1:131 (1898), type loc. volcanic upland, Santa Catalina Isl., *Trask;* Trask, Erythea 7:143 (1899). *E. crassifolium* var. *traskiae* Brand; Engler, Pflzr. 4^{251}:140 (1913); Jepson, Man. 835 (1925).

8. **E. parryi** Greene. Stems coarse, erect, densely leafy below, slightly woody at base, several in a clump from a deep taproot, 4 to 9 (or 12) feet high; herbage viscid-hirsute and ill-scented; leaf-blades lanceolate, coarsely serrate to dentate or denticulate, acuminate, drawn down to a narrow base, sessile (or subsessile), 3 to 12 inches long; flowers in scorpioid spikes, the spikes in a virgate panicle ½ to 2½ feet long; pedicels short (½ line); calyx glandular-hirsute, its lobes linear-lanceolate, about ¼ length of corolla; corolla purple or lavender, pubescent outside, obscurely 2-lipped, the middle lobe of lower lip smaller than the lateral, the tube 5-angled at base; stamens included, 3 long and 2 short; filaments ⅔ to ¾ adnate, slightly hairy at their middle, the adnate portion winged on each side; base of style and summit of ovary hairy; styles distinct to base; ovules about 7 to 14 in each cell of the ovary; capsule about 4 to 12-seeded.

Sandy or gravelly soil of slopes and ridges in the mountains, (2000 or) 4000 to 7000 feet: southern Sierra Nevada from Fresno Co. to Kern Co.; inner South Coast Range in San Luis Obispo Co.; intramontane in ranges bordering the Mohave and Colorado deserts on the west; cismontane Southern California. South to San Pedro Martir, northern Lower California. June-July.

Field note.—Although thought of as a rare plant, Eriodictyon parryi is at some stations abundant in individuals, as at the head of Lone Pine Cañon in the eastern San Gabriel Mountains (*Wolf* 2498). It has also been observed as common in the open woodlands on the northeasterly summits of Palomar Mountain where it is associated with Quercus kelloggii, Libocedrus decurrens and Pseudotsuga macrocarpa (*Jepson* 1489). In the San Gabriel Mountains it prefers the summits of ridges (*F. W. Peirson*). In the Piute Mountains of the Sierra Nevada in Kern County there are two colonies near the road between Loraine and Piute Lookout (*C. N. Smith* 219). At other stations, on the contrary, as in Bull Creek basin, drainage of the Kern River, only two individuals have been observed (*C. N. Smith* 38). During the flowering period the tall simple stems are densely clothed with leaves well up towards the inflorescence, those toward the base of the stem being reflexed or pendulous. The placental partitions do not meet in the axis, the capsule thus being incompletely 2-celled. Dehiscence first begins septicidally and is soon followed by loculicidal rupture. The cells are 2 to 4 or even 8-seeded.

Locs.—S. Sierra Nevada from Fresno Co. to Kern Co.: Horseshoe Bend, Kings River, Fresno Co., *Virginia Bailey;* Shadequarter Mt., Tulare Co., *Geo. Purdy;* Kernville, *Hall & Babcock* 5095. Inner South Coast Range in San Luis Obispo Co.: Goodwin, e. part of county, perhaps near Simmler (Zoe 4:155). Intramontane and cismontane S. Cal.: Pine Cañon, Liebre Mts., *Hall* 3088; Lockwood Valley, Mt. Piños, *Hall* 6697; Alamo Mt., n. Ventura Co., *Hall* 6707; Pine Cañon, Elizabeth Lake, *Hall* 3088; Mt. Wilson, San Gabriel Mts., *Peirson* 170; Kentucky Sprs., San Gabriel Mts., *Barber* 209; Swartout Valley, San Gabriel Mts., *Epling;* San Bernardino Mts.

(n. slope), *Parish* 3691; Devore, near San Bernardino, *Parish* 6954; Strawberry Valley, San Jacinto Mts., *Jepson;* betw. Glen Ivy and Santiago Peak, Santa Ana Mts., *Munz* 7061; Julian, Cuyamaca Mts., *Dunn;* Laguna grade, Laguna Mts., *Griscom.*

Refs.—ERIODICTYON PARRYI Greene, Pitt. 2:22 (1889). *Nama parryi* Gray, Bot. Cal. 1:621 (1876), type loc. desert slope of San Bernardino Mts., *Parry;* Jepson, Man. 833 (1925). *Turricula parryi* Mcbr., Contrib. Gray Herb. 49:42 (1917).

12. **HESPEROCHIRON** Wats.

Dwarf perennial herbs. Flowers solitary on naked peduncles arising from a leaf-rosette on the ground. Leaves equaling or exceeding the peduncles, their blades ovatish, oblong or spatulate, entire, ciliate, petioled. Calyx 5-parted, with linear-lanceolate lobes. Corolla dull white with pinkish or purplish veins, campanulate to bowl-shaped, the stamens inserted on the base of its tube. Filaments subulate, more or less hairy at base. Ovary 1-celled; placentae narrow, parietal or projecting into the cell on narrow plates or partial partitions. Style 2-cleft at apex.—Species 2 or 3, western North America. (Greek hesperos, western, and Chiron, one of the centaurs versed in medicine.)

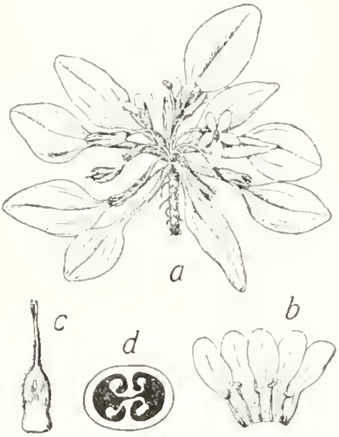

Fig. 409. HESPEROCHIRON CALIFORNICUS Wats. *a,* habit, × ½; *b,* corolla spread open, × 1; *c,* pistil, × 3; *d,* cross-sect. of ovary, × 6.

Corolla-tube oblong-campanulate, its ascending lobes shorter than the tube; calyx pubescent................ 1. *H. californicus.*

Corolla-tube bowl-shaped, its spreading lobes longer than the tube; calyx glabrous, its lobes ciliate............. 2. *H. pumilus.*

1. **H. californicus** Wats. (Fig. 409.) Plants 1 to 2 inches high; herbage grayish-pubescent to subglabrous; leaves many in a basal tuft, the blades ovate to elliptic or oblanceolate, narrowed at base to a short petiole, 1 to 1½ inches long; corolla white with a flare of pinkish veins, a little hairy inside at base, 6 to 10 lines long; filaments hairy at base.

Mountain valleys and flats, 4000 to 9000 feet: San Bernardino Mts.; Sierra Nevada, mostly on the east side or easterly summits, from Tulare and Mono Cos. to Modoc and Siskiyou Cos. East to Utah, north to Washington. May-July.

Locs.—San Bernardino Mts.: Bear Lake, *Peirson* 4585. Sierra Nevada: Monatchee Mdws., Tulare Co., *Purpus* 1858; Templeton Mt., near Kern Peak, *Jepson* 4970 (covers thousands of acres of flats); Hot Creek, Mono Co., *Peirson* 12,441; Benton, Mono Co., *Renner* 81; Lake Washburn, Merced Co., *Jepson;* betw. Glen Alpine Falls and Angora Lakes, Eldorado Co., *Ottley* 853; Norvell Flat, near Westwood Jct., sw. Lassen Co., *C. S. Robinson* 10; Dismal Swamp, near Mt. Bidwell, Modoc Co., *L. S. Smith* 1159; Edgewood, Siskiyou Co., *Kisling;* Etna, Siskiyou Co., *Doris Utz.*

Refs.—HESPEROCHIRON CALIFORNICUS Wats., Bot. King, 281, pl. 30 (1871); Jepson, Man. 835 (1925). *Ourisia californica* Benth., Pl. Hartw. 327 (1849), type loc. "in montibus Sacramento," *Hartweg* 367, that is in Bear Valley, Nevada Co., n. Sierra Nevada (cf. Erythea 5:55). *Capnorea californica* Greene, Pitt. 5:44 (1902). *H. latifolius* Kell., Proc. Cal. Acad. 5:44 (1873), type loc. Yuba River, *Kellogg. H. californicus* var. *latifolius* Brand, Univ. Cal. Publ. Bot. 4:226 (1912). *H. californicus* var. *benthamianus* Brand, l.c., type loc. headwaters of the Sacramento River, *Jeffrey* 1135; the Yosemite Valley locality cited by Brand is perhaps doubtful. *Capnorea strigosa* Greene, l.c., type loc. Yreka, *Greene. H. californicus* var. *strigosus* Brand, l.c. *Capnorea watsoniana* Greene, l.c., type loc. Carson City, Nev., *Watson. H. californicus* var. *watsonianus* Brand, l.c. *Capnorea leporina* Greene, l.c. 45, type loc. Rabbit Sprs., Mohave Desert, *Parish. H. californicus* var. *benthamianus* subvar. *leporinus* Brand; Engler, Pflzr. 4^{251}:166 (1913).

2. **H. pumilus** Porter. Plants ¾ to 2 inches high; herbage greenish, the leaves subglabrous except on the margins or sometimes puberulent above; leaves in a basal tuft, the blades oblong or ovatish to lanceolate, 1 to 2¼ inches long, the petioles

¼ to ½ as long; calyx glabrous, its lobes 5 (or 6), ciliate; corolla white, with dark purple veins, 3 to 4 lines long, 4 to 8 (or 14) lines wide, its lobes longer than the tube, a zone of hairs at base of tube inside; corolla lobes 5 (sometimes 6); filaments fleshy, dilated downward, hairy at base.

Moist flats or meadows in the mountains, (1200 or) 2800 to 8000 feet: North Coast Ranges from Lake Co. to western Siskiyou Co.; Sierra Nevada, west slope, from Fresno Co. to Plumas Co.; Sierra Nevada, transmontane, from Lassen Co. to Modoc Co. East to Nevada and Montana, north to Washington. Apr.-June.

Note on the placentae.—In Hesperochiron pumilus the placentae, which are very narrow, extend from the base of the ovary cell to the apex and are parietal. In Hesperochiron californicus, on the contrary, the placentae, likewise very narrow, occur only on the upper half of the cell and are slightly projected into the cell on partial partitions.

Locs.—North Coast Ranges: Kelseyville, Lake Co., *Pauline Schulthess;* near Dry Creek, w. of Red Bluff, *J. D. Sweeney;* Oro Fino, Siskiyou Co., *Butler* 1210. Sierra Nevada (west slope): betw. Huckleberry Mdw. and Grant Park, s. Fresno Co., *Newlon* 215; Tamarack Mdws., near McKinley Big Trees, Fresno Co., *A. L. Grant* 1202; Huntington Lake, *Geo. W. Graves;* Jackass Mdw., Madera Co., *A. L. Grant* 1312; Peregoy Mdws., Yosemite, *Jepson* 4339; Yosemite Creek trail, *A. L. Grant* 1288; Chester (6 mi. from), Plumas Co., *J. Grinnell.* Sierra Nevada (east side): Norvell Flat, n. of Westwood Jct., sw. Lassen Co., *C. S. Robinson* 11; Forestdale, sw. Modoc Co., *M. S. Baker.*

Refs.—HESPEROCHIRON PUMILUS Porter; Torr. in Hayden, U. S. Geol. Rep. 6:778 (1873); Jepson, Man. 835 (1925). *Villarsia pumila* Dougl.; Griseb. in Hook., Fl. Bor. Am. 2:70, t. 157 (1838), type loc. betw. Kettle Falls and Spokane, ne. Wash., *Douglas. Menyanthes pumila* Dougl.; Griseb., Gen. et Spec. Gent. 338 (1839). *Capnorea pumila* Greene, Erythea 2:193 (1894). *C. hirtella* Greene, Pitt. 5:51 (1902), type from e. Wash., *Howell. H. pumilus* f. *hirtellus* Brand, Univ. Cal. Publ. Bot. 4:227 (1912). *Capnorea campanulata* Greene, l.c. 52, type loc. Collins Mdw., Fresno Co., *Hall & Chandler* 550. *H. campanulatus* Brand, l.c. *H. pumilus* var. *ciliatus* Brand, l.c., not H. ciliatus Greene, Pitt. 1:282 (1889), type loc. Soda Sprs., Esmeralda Co., Nev., *Shockley* (Capnorea ciliata Greene, Erythea 2:193,—1894), which belongs (acc. Greene) in the H. californicus group.

13. **TRICARDIA** Torr.

Perennial herb, the leaves mostly basal, all entire. Flowers rather few in loose spicate racemes. Calyx purplish, its lobes almost distinct, very dissimilar, the 3 outer large and cordate, becoming much enlarged, scarious and reticulate-veiny in fruit, the 2 inner small, linear. Corolla white with purplish markings, broad-campanulate, slightly contracted at the mouth, the lower part of tube inside with 10 narrow scales free from the filaments. Stamens unequal, equally inserted on the lower part of the corolla-tube. Ovary 1-celled, glabrous; ovules 1 to 4 on each placenta; style 2-cleft. Capsule thin-walled, 1-celled.—Species 1. (Greek tri, three, and cardia, heart, referring to the outer calyx-lobes.)

1. **T. watsonii** Torr. Stems ascending, 5 to 11 inches high, several from a stout root-crown which is heavily thatched with the petiole bases of previous years; herbage puberulent or villous; leaf-blades ovate to oblong or lanceolate, 1 to 1½ inches long, petioled; cauline leaves reduced, shortly petioled or subsessile; 3 outer calyx-lobes in anthesis 2 lines long, becoming ½ to 1 inch long in fruit; corolla 3 lines long.

Deep sand or loam of desert cañons and low hills or desert mountains: northwest arm of the Colorado Desert, 600 to 1400 feet; San Bernardino Mts. (north slope), 4000 to 4100 feet; eastern Mohave Desert, 3000 to 4000 feet; Inyo Co., 3500 to 7400 feet. East to Arizona and southern Utah. Apr.-June.

Locs.—Colorado Desert (northwest arm): Palm Sprs. of San Jacinto, *S. B. & W. F. Parish* 721; Mission Creek, *Clary;* Whitewater, *Peirson* 5. Eastern Mohave Desert: Cushenbury Sprs., n. slope San Bernardino Mts. (Zoe 4:165); Mitchell Caverns, Providence Mts., *Jepson* 18,178. Inyo Co.: Hanaupah Cañon, Panamint Mts., *Peirson* 9923; Argus Peak, Argus Mts., *Purpus* 5394; Lone Pine, *T. Brandegee;* Silver Cañon, White Mts., *Heller* 8214.

Refs.—TRICARDIA WATSONII Torr.; Wats., Bot. King 258, t. 24 (1871), type loc. foothills of Truckee Pass., w. Nev., *Watson;* Jepson, Man. 835 (1925).

14. ROMANZOFFIA Cham.

Low and delicate perennial herbs with the aspect of some species of Saxifraga. Stems slightly scapelike, the leaves mostly basal, with the cauline few and alternate. Leaf-blades round-cordate, crenately lobed, long-petioled. Flowers loosely racemose, sometimes with a few reduced bracts. Calyx 5-parted into nearly distinct calyx-lobes. Corolla white, broadly funnelform. Stamens unequal, inserted on the base of the corolla-tube. Style filiform, entire; stigma small. Capsule 2-celled or nearly so, the thickened placentae meeting or approximate in the center. Seeds numerous.—Species 5, Pacific North America and Asia. (Count Nikolai von Romanzoff, promoter of the Russian voyage of Kotzebue which visited the California coast in 1816; dedicated to him by Adelbert von Chamisso, the German poet and botanist, who accompanied the expedition.)

Plants with a cluster of fleshy tubers at the base of the stem; petioles not dilated at base.
  Herbage glabrous; racemes soon loose, the fruiting pedicels spreading, 3 to 8 (or 13) lines long; calyx ⅕ to nearly ½ as long as corolla, its lobes wingless; valves of capsule splitting at apex in age........1. *R. californica.*
  Herbage villous; racemes moderately dense, the fruiting pedicels suberect, 1½ to 2 (or 4) lines long; calyx ½ to ¾ as long as corolla, its lobes in fruit with a very narrow median wing; valves of the capsule slightly retuse at apex, not splitting in age........2. *R. tracyi.*
Plants destitute of tubers; petioles bulbous-dilated at base of basal leaves........3. *R. sitchensis.*

1. **R. californica** Greene. Stems slender, 4 to 10 inches high, arising from a filiform rootstock bearing a conspicuous cluster of tubers, the tubers fleshy, scalelike, matted-hairy; herbage glabrous; leaf-blades ½ to 1¾ inches broad, on petioles 1 to 4 inches long; pedicels spreading, soon longer than the flowers; calyx-lobes linear or lanceolate, ⅕ to nearly ½ as long as the corolla and exceeded by the capsule; corolla 4 to 6 lines long; capsule oblong, 2 to 4 lines long.

Moist rocks in shady places near the coast line, 50 to 2500 feet: Santa Cruz Co. to Siskiyou Co. Apr.-May.

Biol. note.—At the base of the stem in Romanzoffia californica there is borne a conspicuous cluster of fleshy tubers,—two or three to seven in number. These tubers are flattish, ovatish or orbicular in outline, 3 to 6 lines long and are covered with a rather dense or matted coat of brownish hairs. They are morphologically fleshy bud scales. It would seem as if the rootstock structure, though very slender but thus associated with so heavy a cluster of tubers, must represent a plant of perennial duration. The flowers of the raceme, especially the lower ones, are often replaced by bulblets which serve for vegetative reproduction.

Our California plant, as cited below, has been hitherto, in Californian floras, referred to Romanzoffia sitchensis Bong. It is found in ranges near the coast and does not occur anywhere in the inner Coast Range.

Locs.—Governors Camp, Big Basin, Santa Cruz Mts.; Crystal Springs Lake, San Mateo Co., *Bloomer;* San Bruno, *Kellogg;* Mt. Tamalpais above Ross Valley, *Jepson* 20,997; Cataract Gulch, Mt. Tamalpais, *Virginia Bailey;* Kneeland Prairie, Humboldt Co., *Tracy* 6196; Willow Creek Cañon, n. Humboldt Co., *Tracy* 6645; Trinidad, n. Humboldt coast, *Tracy* 2970; Prairie Creek, Humboldt Co., *Tracy* 8424; Somes Bar, Siskiyou Co., *Tracy* 16,269.

Refs.—ROMANZOFFIA CALIFORNICA Greene, Pitt. 5:39 (1902), "San Mateo Co. [Cal.] to perhaps Oregon." *R. sitchensis* Jepson, Fl. W. Mid. Cal. 440 (1901), ed. 2, 343 (1911), Man. 835 (1925); not Bong. *R. mendocina* Greene, Pitt. 5:40 (1902), type from Mendocino Co., *Vasey. R. spergulina* Greene, Pitt. 5:41 (1902), type loc. Pilarcitos Creek, San Mateo Co., *Davy* 1065.

2. **R. tracyi** Jepson sp. n. Stems few or several from the base, ascending, 2½ to 7 inches long, arising from a cluster of compressed tubers, the tubers matted-hairy; stems and petioles, and also the pedicels, calyces and capsules villous, the stems often densely so, the upper parts slightly glandular; leaf-blades thinly pubescent, 3 to 9 lines broad; racemes terminal on the stems and branches, moderately dense, ½ to 2 inches long in fruit; fruiting pedicels 1½ to 2 (or 4) lines long; calyx-lobes lanceolate, ½ to ¾ as long as the corolla, in fruit accrescent, the midrib developing a very narrow vertical wing; corolla 2½ to 3 lines long; capsule elliptic, 3 lines long, the valves obscurely retuse at apex.—(Caules a basi pauci vel

plures, ascendentes, 2½–7 unc. longi, ex glomerulo tuberum compressatorum implecto-hirsutorum; caules et petioli et pedicelli et calyces villosi, caules saepe dense villosi; foliorum laminae raro pubescentes, 3–9 lin. latae; racemi terminales, subdensi, in fructu ½–2 unc. longi; pedicelli fructiferi 1½–2 (vel 4) lin. longi; calycis lobi lanceolati, ½–¾ longitudinis corollae, in fructu accrescentes, costa media anguste recteque alata; corolla 2½–3 lin. longa; capsula elliptica, villosa, 3 lin. longa, valvis ad apicem obscure retusis.)

Ocean bluffs, 50 feet: Humboldt coast. May.

Tax. note.—Romanzoffia tracyi was discovered on a wet slide near the ocean at Trinidad in 1933 by Joseph P. Tracy. One would expect it to represent, most probably, a southern or marginal occurrence of some northern species, but it has not as yet been possible to homologize it with any northern or northwest coast material. Admittedly, it seems in nearly all particulars too near Romanzoffia unalaschensis Cham. of Alaska, but that species has the leaves bulbous-dilated at base and is destitute of basal clusters of bulblets (cf. *Jepson* 34, collected at Iliuliuk, Unalaska, Aleutian Isls., the type locality).

Ref.—ROMANZOFFIA TRACYI Jepson; type loc. Trinidad, Humboldt Co., *Parks & Tracy* 11,008 (typ. in Herbario Jepsoniano).

3. **R. sitchensis** Bong. Similar in habit, leaves and inflorescence to R. californica; capsule equaling the calyx-lobes to twice as long.

Moist clefts of rocks, montane, 6000 to 7000 feet: Trinity Co. to Siskiyou Co. North through the Cascade Mts. to Alaska where it is found near sea-level. Aug.-Sept.

Biol. note.—Romanzoffia sitchensis is destitute of tubers according to Greene (Pitt. 5:35), a statement which seems confirmed by Bongard's illustration of R. sitchensis in the original publication. Greene stresses the bulbous-dilated bases of the basal petioles in both R. sitchensis and in R. unalaschensis. The bulbous character in R. sitchensis is well shown in Bongard's illustration. As to R. unalaschensis, specimens collected at its type locality (Iliuliuk, Aleutian Islands, *Jepson* 34) show well the bulbous-dilated petiole bases and the absence of tubers,—points confirmed by the Jepson field book records.

Locs.—White Creek (head of), Devils Cañon Mts., Trinity Co., *Tracy* 14,597; Scott Mts., s. Siskiyou Co. (Pitt. 5:36).

Ref.—ROMANZOFFIA SITCHENSIS Bong., Mem. Acad. Imp. St. Petersb. ser. 4, 2:158, t. 4 (1832), type loc. Sitka, Alas., *Mertens*.

BORAGINACEAE. Borage Family

Herbs, usually rough with coarse hairs. Leaves simple, commonly alternate and entire. Flowers complete, in one-sided spikes or racemes, coiled spirally (scorpioid) and uncoiling as flowering proceeds. Calyx commonly with 5 divisions or lobes. Corolla regular, 5-lobed. Stamens 5, inserted on the tube or throat of the corolla and alternate with its lobes, in ours included in the tube or throat, the filaments short. Ovary superior, 4-celled, deeply 4-lobed, with a simple style inserted between the lobes, in fruit splitting into 4 one-seeded nutlets (or the nutlets fewer by abortion). Style entire or none, rarely 2-cleft. Nutlets commonly roughened or prickly, sometimes smooth. Endosperm none, except in Heliotropium.—The spikes or racemes (here so-called for convenience) are really one-sided scorpioid cymes. The scorpioid character of the inflorescence is, however, often obscured in some species. The nutlets are inserted on a flat or a convex receptacle, or often on a short thick prolongation of the receptacle known as the gynobase; they are often keeled ventrally or dorsally, usually with a line-like ridge or sometimes with a vertical plate. The ovary is not deeply parted in Heliotropium, Euploca and Coldenia; it is at most merely lobed or laterally grooved.—Genera about 100, species about 1800, all continents.

Bibliog.—Lehmann, J. G. C., Plantae e familia Asperifoliarum nuciferae, 1–478 (1818). Gray, A., Burs in the borage family (Am. Nat. 10:1–4,—1876); Notes on Boraginaceae (Proc. Am. Acad. 10:48–62,—1874; 19:89–90,—1883); Revision of some Boragineous genera (l.c. 20: 257–286,—1885). Greene, E. L., Some West American Asperifoliae (Pitt. 1:8–23, 55–60, 107–120,—1887; 4:86–97,—1899); [New species of Oreocarya], (Pitt. 3:109–114,—1896). Parish, S. B., [Note on Pectocarya], (Zoe 1:209,—1890). Piper, C. V., Notes on the biennial and perennial W. Am. species of Lappula (Bull. Torr. Club 29:535–549,—1902); Study of Allocarya (Contrib. U. S. Nat. Herb. 22:79–113,—1920). Eastwood, A., New species of Oreocarya (Bull. Torr. Club 30:238–246,—1903). Nelson, A., & Macbride, J. F., Lappula [western U. S., key and notes], (Bot. Gaz. 61:36–42,—1916). Macbride, J. F., Certain Boraginaceae, new or transferred (Proc. Am. Acad. 51:541–548,—1916); True Mertensias of western N. Am. (Contrib. Gray Herb. 48:1–20,—1916); Revision of genus Oreocarya (l.c. 48:20–38,—1916); Notes on certain Boraginaceae (l.c. 48:39–58,—1916); Revision of N. Am. species of Amsinckia (l.c. 49:1–16,—1917); Further notes on the Boraginaceae (l.c. 49:16–22,—1917); [Notes on Boraginaceae], (l.c. 56: 57–59,—1918); A defense of Allocarya (Field Mus. Nat. Hist. Bot. 4:119–122,—1927).

In August, 1918, one of the author's graduate students at Berkeley came seeking advice as to a suitable piece of research in the field of systematic botany. To this student (later an investigator) was recommended the family Boraginaceae, especially as developed in western America, because it provides problems so profound as to furnish a challenge to the highest powers of observation, penetration, judgment and skill in the apprehension of genera and species. The following list of papers (citing only those relating to western America) in content and scope shows how far this research botanist has since traveled the road of "his beloved borages": Johnston, I. M., Restoration of genus Hackelia (Contrib. Gray Herb. 68:43–48,—1923); Novelties and new combinations in the genus Cryptantha (Contrib. Gray Herb. 68: 52–57,—1923); Synopsis and redefinition of genus Plagiobothrys (Contrib. Gray Herb. 68:57–80,—1923); Synopsis of Am. native and immigrant borages of the subfamily Boraginoideae (Contrib. Gray Herb. 70:3–55,—1924); N. Am. species of Cryptantha (Contrib. Gray Herb. 74:3–114,—1925); The Allocarya section of Plagiobothrys in the western U. S. (Contrib. Arn. Arb. 3:1–82,—1932); Notes on various borages of the western U. S. (l.c. 3:83–102,—1932); New or otherwise noteworthy species [of Boraginaceae], chiefly from the western U. S. (Journ. Arn. Arb. 20:375–402,—1939).

Brand, A., Cynoglosseae (Engler, Pflzr. 4^{252}:1–183, figs. 1–22,—1931); Cryptantheae (l.c. 1–236, figs. 1–22,—1931); Drei neue Gattungen der Cryptantheae (Fedde, Repert. Spec. Nov. 21:249–254,—1925). Payson, E. B., [Notes on] Oreocarya (Univ. Wyo. Publ. Bot. 1:164–171,—1926); Monograph of section Oreocarya of Cryptantha (Ann. Mo. Bot. Gard. 14:211–358,—1927). Suksdorf, W., Untersuchungen in der Gattung Amsinckia (Werdenda 1:47–113,—1931). Williams, L. O., Monograph of the genus Mertensia in N. Am. (Ann. Mo. Bot. Gard. 24: 17–159,—1937).

A. Ovary undivided or merely lobed (sometimes 2 or 4-grooved on the sides), the style terminal.

Style entire, the stigma annular-peltate.
  Flowers axillary (or appearing so) and solitary; fruit 2-lobed, each lobe globose, splitting into 2 nutlets; stigma surmounted by a central tuft of bristles; desert annual.......... 1. EUPLOCA.
  Flowers in dense scorpioid spikes; fruit not lobed, splitting into 4 nutlets; stigma cap-like, not tufted (in ours); common wide-spread perennial..........2. HELIOTROPIUM.
Style 2-cleft, the stigmas capitate; desert herbs, sometimes suffrutescent..........3. COLDENIA.

B. Ovary deeply 4-parted; style entire (rarely 2-cleft at apex) or none, arising from between the lobes of the ovary.

1. NUTLETS ARMED WITH CONSPICUOUS PRICKLES OR SPINES.

Nutlets globose or thick, the prickles barbed; corolla mostly blue, rarely pink or white; plants mostly stout, usually tall (1 to 3 feet).
  Nutlets spreading, globose, not margined, prickly all over; perennials.........4. CYNOGLOSSUM.
  Nutlets erect, thick but margined, the margin prickly and sometimes prickly on the back; perennials or annuals..........5. LAPPULA.
Nutlets thin and flat, divergent or spreading in pairs; corolla white; low (3 to 10 inches high) slender annuals..........6. PECTOCARYA.

2. NUTLETS SMOOTH, TUBERCULATE, MURICATE, RUGOSE OR ROUGHISH, NOT ARMED (OR A FEW SPECIES IN ALLOCARYA ARMED WITH MOSTLY SHORT OR INCONSPICUOUS USUALLY BARBED PRICKLES).

1. Calyx pubescent, hirsute, bristly or glabrous.

Receptacle flat or merely convex; perennials (except 2 species in Myosotis).
  Flowers with tubular or tubular-campanulate corollas; corollas blue; nutlets wrinkled; Sierra Nevada, west slope and east side..........7. MERTENSIA.
  Flowers with rotate, salverform or funnelform corollas; nutlets smooth and shining.
    Throat of the corolla contracted by prominent crests; racemes mostly without bracts; corolla blue or rarely white; one native species in Del Norte Co., the others wide-spread aliens..........8. MYOSOTIS.
    Throat of corolla naked or with low crests; racemes bracteate; corolla yellow; n. Cal....... 9. LITHOSPERMUM.
Receptacle more or less elongated or produced upward into a slender structure or gynobase to which the nutlets are attached.

Corolla bright or orange yellow, the throat open and usually naked (rarely with palate-like folds); annuals; widespread..........10. Amsinckia.

Corolla white or cream-color or pale yellow, the throat with more or less prominent bulbous swellings or crests.

Perennials, mostly caespitose; calyx persistent; nutlets not carinate or only medianly lineate; mostly high montane..........11. Oreocarya.

Annuals (except 1 or 2 perennial species in Cryptantha and Allocarya); mostly low altitudes.

Calyx circumscissile (cf. also 2 species of Plagiobothrys, no. 17); transmontane deserts and intramontane meadows or slopes..........12. Greeneocharis.

Calyx not circumscissile.

Nutlets not keeled ventrally (nor dorsally or only obscurely or partially at apex), grooved ventrally above the basal scar, usually erect, attached from the basal scar to the middle or to the apex along the ventral groove; calyx (and pedicels) usually falling away with the fruit; corolla-throat with crests; leaves commonly alternate.

Stems irregularly branched; spikes bractless or irregularly few-bracteate (especially toward base), rarely bracteate throughout and then the bracts unequal; gynobase subulate; style not dilated in fruit; widespread..........13. Cryptantha.

Stems dichotomously branched; racemes spike-like, regularly and equally bracteate (each flower subtended by a bract); gynobase columnar; style dilated in fruit; mostly deserts and intramontane slopes..........14. Eremocarya.

Nutlets keeled ventrally and often also dorsally; ventral groove none or rarely present and then enclosing the keel; calyx and pedicels persistent; corolla-throat with only obscure crests.

Nutlets mostly erect, attached by a scar or groove but not caruncular; corolla white with yellow throat (often fading); lower leaves opposite, not in a basal rosette; widespread..........15. Allocarya.

Nutlets oblique or incurved so that the apices are approximate in center, attached above the base to a thickened scar or caruncle; corolla entirely white.

Caruncle borne on a stipe-like base; leaves alternate, the lowest not in a rosette; South Coast Ranges and coastal S. Cal..........16. Echidiocarya.

Caruncle commonly borne in a hollow or transverse groove; leaves mostly in a basal rosette, the cauline alternate; widespread..........17. Plagiobothrys.

2. *Calyx-lobes armed with barbed prickles, the calyx in fruit modified to form a bur-like envelope for the nutlets; annual; S. Cal*..........18. Harpagonella.

1. EUPLOCA Nutt.

Small annuals. Flowers solitary. Corolla white, the upper part of the tube enlarged and the orifice narrowed, the limb scarcely lobed. Anthers ovate-lanceolate, inserted midway of the corolla-tube. Style elongated, its stigma annular or 2-lobed, surmounted by a conspicuous tuft of bristles. Fruit didymous, each globose half splitting into 2 hemispherical one-seeded nutlets.—Species 1. (Greek eu, well, and ploke, a woven thing.)

1. **E. albiflora** Jtn. var. **californica** (Greene) Jepson & Hoover comb. n. Stem branched, 1 to 3 inches high; leaf-blades, calyx, corolla-tube and midnerve of limb strigose-hispid, the stems and petioles mostly spreading-hispid, all the hairs pustulate at base; leaf-blades ovate to oblong-lanceolate, 5 to 15 lines long, petioled; flowers "sweet-scented," borne on short (½ line) pedicels; corolla 5 lines broad; fruit hairy.

Desert sandhills, flats and playas, 200 to 1800 feet: eastern Mohave Desert; northeastern Colorado Desert. East to Arizona. Apr.-May.

Locs.—E. Mohave Desert: Calico Mine (near), *K. Brandegee;* Ludlow, *Jepson* 5497; Soda Lake, near Baker, *Parish* 9875; Kelso Sand Dunes, acc. *Mary Beal.* Ne. Colorado Desert: Marie Mts., *Schellenger.* These California collections, as representing the variety, differ from the species eastward only in the spreading hairs of stems and petioles.

Refs.—EUPLOCA ALBIFLORA Jtn., Contrib. Gray Herb. 70:53 (1924); Jepson, Man. 836 (1925). *Batschia albiflora* Raf., New Fl. N. Am. pt. 4:19 (1836), type loc. Arkansas River. *E. convolvulacea* Nutt., Trans. Am. Phil. Soc. ser. 2, 5:190 (1837), type loc. "banks of Arkansas." *Heliotropium convolvulaceum* Gray, Mem. Am. Acad. ser. 2, 6:403 (1857). Var. CALIFORNICA Jepson & Hoover. *Heliotropium californicum* Greene, Bull. Cal. Acad. 1:202 (1885), type loc. Amboy, Mohave Desert, *Curran*. *H. convolvulaceum* var. *californicum* Jtn., Contrib. Arn. Arb. 3:83 (1932).

2. **HELIOTROPIUM** L. HELIOTROPE

Ours herbs with alternate mostly entire leaves. Flowers white, in dense scorpioid spikes. Calyx-segments lanceolate or linear. Corolla salverform, short, with open throat; sinuses more or less plaited in the bud. Stamens included; anthers acuminate, distinct, nearly sessile. Style (in ours) none, the stigma turned downward over summit of ovary and thus resembling a skull-cap. Ovary not lobed (but slightly 4-creased longitudinally), separating when ripe into 4 one-seeded closed nutlets.—Species about 200, all continents. (Greek, helios, sun, and trope, a turning, "The flowers beginning to appear at the summer solstice.")

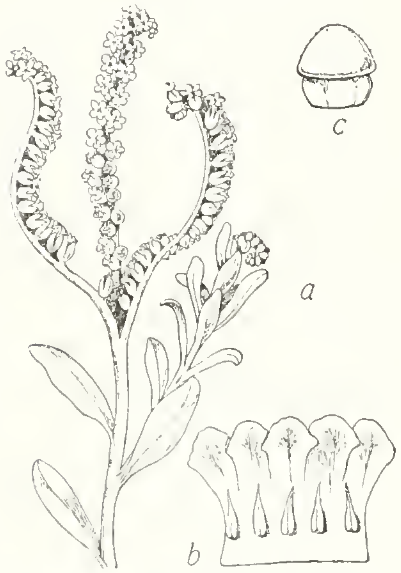

Fig. 410. HELIOTROPIUM CURASSAVICUM L. *a*, fl. branchlet, × 1; *b*, corolla spread open, × 5; *c*, ovary crowned by the cap-like stigma, × 10.

1. **H. curassavicum** L. CHINESE PUSLEY. (Fig. 410.) Stems branching, ½ to 3 feet long, prostrate, from a perennial root; herbage glabrous, glaucous, fleshy; leaf-blades obovate to broadly oblanceolate; spikes mostly in pairs (sometimes 3 or 4); corolla china-white with the yellow eye changing to purple, 1½ to 3 lines long; stigma not hairy.

Marshes, stream beds and alkaline flats or plains, often associated with Distichlis spicata, 10 to 4800 (or 6750) feet: throughout California. North to Washington, east to Virginia. Maritime over warmer parts of the earth. Apr.-Aug.

Note on the flower.—The white corolla soon becomes purplish, especially in the center (throat). The anthers are produced into acuminate tips which valvately close the entrance to the corolla-tube in early anthesis. After dehiscence of the anther-cells, the anthers spread and become lanceolate with recurved tips.

Locs.—Coastal S. Cal.: San Diego, *Palmer* 255; Escondido, *C. V. Meyer* 452; Temescal Cañon, Riverside Co., *Jepson;* Newport, Orange Co., *Alice King;* San Bernardino Valley, *Parish* 318; Los Angeles, *E. D. Palmer;* Los Sances Creek, Ventura coast, *Jepson* 20,167; Lompoc, Santa Barbara Co., *Jos. Howard.* Transmontane deserts, S. Cal.: Vallecito, e. San Diego Co., *Jepson;* Needles, *Jones* 3866; Barstow, *Jepson.* Coast Ranges: Los Osos Valley near San Luis Obispo, *Jepson;* Pt. Piños, Monterey Co., *Heller* 8408; Alviso, Santa Clara Co., *Jepson* 9824; betw. Salada and Mussel Rock, San Mateo Co., *Newlon* 247; West Berkeley, *Bioletti;* Devil's Gate, Putah Pass, *Jepson;* Middletown (6 mi. e.), Lake Co., *M. S. Baker* 2318a; Geyserville, Sonoma Co., *M. S. Baker* 440; Stone Lagoon, Humboldt coast, *Tracy* 14,747. Great Valley: Bakersfield, *Davy* 1772; Selma, *H. P. Kelley;* Kerman, Fresno Co., *Jepson;* Stockton, *Davy* 410b; Vacaville, *Jepson* 2368; Roseville, Placer Co., *R. E. Arp;* Orland, Glenn Co., *Jepson* 12,254; Salt Creek, w. Tehama Co., *Jepson.* Sierra Nevada, east side: Funeral Mts., near Furnace Creek ranch, *Jepson;* Burdick grade, Inyo Co., *Almeda Nordyke;* Walker Lake, *Shockley* 437; Goose Lake, Modoc Co., *Austin & Bruce* 2271; Montague, Siskiyou Co., *Butler* 942.

Refs.—HELIOTROPIUM CURASSAVICUM L., Sp. Pl. 130 (1753), type American; Jepson, Fl. W. Mid. Cal. 441 (1901), ed. 2, 344 (1911), Man. 937 (1925). *H. chenopodioides* Willd., Enum. Hort. Berol. 175 (1809), type loc. Pacific shores of middle America. *H. xerophilum* Ckll., Bot. Gaz. 33:379 (1902), type loc. Albuquerque, N. Mex. *H. curassavicum* var. *xerophilum* Nels. &

Mcbr., Bot. Gaz. 61:35 (1916). *H. spathulatum* Rydb., Bull. Torr. Club 30:262 (1903), type loc. Great Falls, Mont., *R. S. Williams* 542. *H. oculatum* Hel., Muhl. 1:58 (1904), type loc. Healdsburg, Sonoma Co., *Heller* 5813. *H. curassavicum* var. *oculatum* Jtn.; Munz, Man. 419 (1935).

HELIOTROPIUM EUROPAEUM L., Sp. Pl. 130 (1753), type from s. Eur. Herbage pubescent; leaf-blades elliptic; style present, short; stigma hairy.—Native of Europe, adventive at Red Bluff (Cal. Dept. Agr. Bull. 30:389).

3. COLDENIA L.

Low prostrate or spreading herbs or herb-like plants, some species suffrutescent, all hoary-pubescent and often hispid, the small pale flowers sessile and usually clustered in the forks or at the ends of the branches and subtended by a circle of leaves. Leaves small, petioled, with veins usually conspicuous. Calyx (in ours) 5-parted into slender segments. Corolla short-funnelform or nearly salverform, 1 to 2 times as long as the calyx, the short lobes broad and rounded. Stamens included. Style 2-cleft or -parted. Ovary entire or 4-lobed, 4-celled. Fruit separating at maturity into 4 one-seeded nutlets, or by abortion fewer.—Species 15, all continents except Europe. (Dr. Cadwallader Colden, Colonial Lieutenant-Governor of New York, a correspondent of Linnaeus.)

Stems dichotomously branched; leaves conspicuously impressed-veined, the longer petioles ½ to 1½ times as long as the blade; corolla-tube bearing scales or plates; style cleft ⅓ or more.
Leaf-blades ovate to rotund or rhombic, grayish-strigose and somewhat hispid or hirsute, with 2 or 3 pairs of veins.
Leaf-margins entire; stems from an annual root .... 1. *C. nuttallii.*
Leaf-margins sinuate; stems arising from a perpendicular perennial root .. 2. *C. brevicalyx.*
Leaf-blades mostly obovate, furrowed with 5 or 6 pairs of veins, the pubescence felty but not hispid or hirsute; stems arising from perennial root-stocks .... 3. *C. palmeri.*
Stems diffusely branched; leaves not obviously veined, the petioles almost none or only ⅕ to ⅓ as long as the blade; corolla-tube destitute of scales or plates; style shortly cleft at apex; stems from a perennial root .... 4. *C. canescens.*

1. **C. nuttallii** Hook. Stems few or several from an annual root, dichotomously branched, forming prostrate mats 4 to 13 inches across; herbage thinly hirsute, the leaves also gray-strigose; leaf-blades ovate to rotund, revolute-margined, with 2 or 3 pairs of impressed veins, 2 to 4 lines long, the petioles often longer; flowers densely clustered in the forks and at the ends of the branches, subtended by a circle of leaves; calyx-lobes linear, hispid and with 1 to 3 setae at tip, equaling the corolla-tube; corolla pink or whitish, 1½ lines long, 1 to 1¼ lines broad, bearing 5 short scales near the base of the tube, the scales triangular, somewhat sac-like, adnate on the sides and open below; filaments shorter than the anthers, inserted in upper part of the corolla-tube; style divided ⅓ or ½; nutlets oblong-ovate, polished, the scar linear.

Sandy plains, washes and hillslopes or moist alkaline flats, –200 to 7000 feet: central Mohave Desert; southern Sierra Nevada in Kern Co.; east slope and east side of the Sierra Nevada from Inyo Co. to Lassen Co. East to Arizona and Wyoming, north to Washington. Argentina, South America. May-Aug.

Locs.—Mohave Desert: Barstow, *Jepson* 4794. Kern Co.: Isabella, *Hall & Babcock* 5094; Kernville, *K. Brandegee.* East side of the Sierra Nevada: Furnace Creek, Death Valley, *Parish* 10,046; Searles Lake, sw. Inyo Co., *Jepson* 7145; Olancha, Inyo Co., *Almeda Nordyke;* Owens Lake, *Jepson* 5103; Bishop, *Heller* 8347; Wyman Creek, White Mts., *Duran* 3051; Mono Lake, *Ottley* 1058; Amedee, Lassen Co., *Davy.*

Refs.—COLDENIA NUTTALLII Hook., Kew Jour. Bot. 3:296 (1851), type loc. n. Rocky Mts., *Nuttall;* Jepson, Man. 837 (1925). *Tiquilia parviflora* Nutt.; Hook. l.c. 296 as synonym. *T. brevifolia* Nutt.; Torr., Bot. Mex. Bound. 136 (1859), type loc. Colorado Desert, *Schott;* Torr., Phanerogamia Pacific Coast, Wilkes Exped. 411, pl. 12 ("T. oregana" on plate by inadvertence), (1874).

2. **C. brevicalyx** Wats. Stems white-barked, dichotomously branched from a woody perennial base, 5 to 16 inches high, the bark exfoliating; branches hirsutulose-pubescent, the leaves grayish-strigulose and somewhat hispidulose; leaf-blades

ovate to rhombic, 2 to 4 lines long, with sinuate revolute margins and 2 to 3 pairs of impressed nerves; calyx 1 line long, its lobes subulate; corolla lavender, 2 lines long, its limb 2½ lines broad; stamens inserted at middle of corolla-tube, their filaments slender, dilated below insertion into oblong plates adnate by one edge, standing vertically; style cleft ½; nutlets subglobose, polished, ¼ to ½ line long.

Dry sandy soil, –100 to 500 feet: along the Colorado River from Mohave Valley to Palo Verde Valley, thence west and south through the Colorado Desert. East to Texas, south to Mexico and Lower California. Mar.-May.

Geog. note.—In the Colorado River valley, plants of Coldenia brevicalyx are characterized by somewhat slender stems, compact flower clusters 1 to 2 or 2½ lines broad, and white-tomentose calyces 1½ to 2 lines long, the calyx-lobes usually not setulose at tip: Needles, *Jones;* McCoy Wash, Palo Verde Valley, *Hall* 5934; Ehrenberg (Ariz.), *J. Grinnell;* Fort Yuma, *Jepson* 11,736. West of the Colorado River, in the Colorado Desert, the plants are coarser and stockier, the flower clusters often looser and 2½ to 4 lines broad, the calyces brownish or grayish-hairy and 2 to 2½ lines long, and the calyx-lobes usually minutely setulose at tip: Painted Cañon, n. of Mecca, *Jepson* 11,687; Kane Sprs., *Ewan* 4095; San Felipe Narrows, ne. San Diego Co., *Jepson* 12,543; Split Mt., *Parish* 9045.

Refs.—COLDENIA BREVICALYX Wats., Proc. Am. Acad., 24:62 (1889), type loc. lower Colorado River, *Palmer;* Jepson, Man. 838 (1925). *C. palmeri* Jtn. in Munz, Man. 418 (1935); not Gray (1870).

3. **C. palmeri** Gray. Stems several from a woody perennial base, freely branched dichotomously, spreading or decumbent and forming a mat or a low dense rounded tuft, 4 to 8 inches high and 6 to 18 inches broad; branches puberulent or glabrate, the leaves densely hairy or with a felt-like grayish pubescence; leaf-blades obovate, sometimes ovate, 2 to 4 lines long, strongly marked with 5 or 6 pairs of nerves, revolute-margined; flowers crowded in small clusters in the forks and at the ends of the branchlets, subtended by a circle of leaves; calyx-lobes subulate, densely hairy-tomentose, especially inside, ⅔ to nearly as long as corolla-tube; corolla bluish or pink, 2 lines long, its limb 1¼ lines broad; filaments inserted near base of corolla-tube or below its middle and projected downward to base of corolla as very narrow plates, adnate by one edge and standing vertically, or sometimes reduced to line-like ridges; style cleft ½ to ¾; nutlets globular or ovoid, smooth and shining, ½ line long, only 1 or 2 maturing, the scar orbicular.

Sandy desert flats and desert dunes, often in shifting sand, –200 to 2600 feet: eastern Mohave Desert; Colorado Desert. East to Arizona. Mar.-June.

Habit note.—The taproot is stout with its crown deep-seated. From this crown are developed 1, 2 or 3 erect slender hypogaeous stems which at the ground surface branch and usually become woody. The seasonal shoots arise from these woody branches and form a complicated dichotomous network. The small flower-clusters are about 2 lines across. In age, the flowers fall away, leaving the extremely abbreviated or dwarf branches, which are now conspicuous as densely white-hairy knobs (or white pellets) at the forks or nodes, the hairs almost, but not completely, concealing the attachment-scars of the flowers.

Locs.—Mohave Desert: Searles Lake, *Jepson* 7145a; Daggett, *Jepson* 20,600; Lavic, *Jepson* 15,469; Kelso Sand Dunes, *Jepson* 20,558; Essex, *Jepson* 18,362; Needles, *Jepson* 5480. Colorado Desert: Banning, San Gorgonio Pass, *Gilman* 45; Palm Springs of San Jacinto, *Parish* 4128; Pleasant Valley near Hexie Mt., *Clary* 1169; Coral Reef ranch, Coachella, *Clary* 1578; Fish Sprs., nw. Imperial Co., *C. V. Meyer* 413; Harper Well, w. Imperial Co., *Jepson* 8906; Vallecito, e. San Diego Co., *Duran* 3194; Brawley, *Parish* 8329; Alamo River near Calexico, *Parish* 8329a; Grays Well, Algodones Sandhills, *Jepson* 11,726.

Refs.—COLDENIA PALMERI Gray, Proc. Am. Acad. 8:292 (1870), type loc. lower Colorado River, *Palmer;* Jepson, Man. 838 (1925). *Tiquilia brevifolia* var. *plicata* Torr., Bot. Mex. Bound. 136 (1859), type loc. Colorado Desert, *Schott. C. plicata* Cov., Contrib. U. S. Nat. Herb. 4:163 (1893).

4. **C. canescens** DC. Stems gnarled, woody and rough-barked, prostrate or procumbent, from a stout perennial base, 2 to 6 inches long; leaves tomentose and thinly short-hirsute, the branches hirsute; leaf-blades ovate or oblong, entire, revolute-margined, not obviously veiny, 3 to 5 lines long, the petioles ¼ to 1 line long; flowers solitary or in small clusters in the axils or forks; corolla white, 2½ to

4 lines long, its limb 2 to 4 lines broad; stamens broadening below insertion to form triangular scales connate at base; style cleft 1/4; nutlets 4, ovate, 1 line long, thick-walled, smooth and rounded on the back, obtuse, the sides plane, obscurely rugose.

Dry sandy soil, –100 to 500 feet: eastern Mohave Desert; Colorado Desert. East to western Arizona, south to Lower California. Mar.-May.

Locs.—E. Mohave Desert: Kelso, acc. *P. A. Munz.* Colorado Desert: Cottonwood Sprs., Eagle Mts., *Parish* 10,286; Ogilby, se. Imperial Co., *C. L. Hitchcock;* Yaqui Well (Ironwood Well), e. San Diego Co., *T. Brandegee.* The var. PULCHELLA Jtn., corolla blue, 4 to 6 lines long, is represented by: Mule Sprs. (10 mi. nw. of Palo Verde), *Hall* 5964; Ogilby (ne.), Chocolate Mts., *Munz & Hitchcock* 12,181.

Refs.—COLDENIA CANESCENS DC., Prodr. 9:559 (1845), type loc. betw. Santander and Victoria, Mex., *Berlandier* 2256; Jepson, Man. 838 (1925); the nutlets in the original form of the species as found in Mexico and Texas are lightly strigulose. *Stegnocarpus canescens* Torr., Pac. R. Rep. 2:169, pl. 7 (1855), Pecos River, valley of the Rio Grande, Tex. *C. canescens* var. *subnuda* Jtn., Proc. Cal. Acad. ser. 4, 12:1137 (1924), type loc. San Nicolas Bay, L. Cal., *Johnston* 3731; the nutlets in the plants found in the California deserts are glabrous. Var. PULCHELLA Jtn., Jour. Arn. Arb. 20:379 (1939), type loc. Kofa Mts., Ariz., *Shreve* 6257.

4. **CYNOGLOSSUM** L.

Ours coarse perennial herbs. Flowers borne in a terminal panicle, the panicle loose or compact, raised on a naked peduncle and composed of bractless racemes. Corolla blue or pink, with a ring of conspicuous crests at the throat. Nutlets large, covered all over with very short barbed prickles and thus bur-like.—Species about 50, all continents. (Greek kuno, dog, and glossa, tongue, on account of the shape and texture of the leaves in some species.)

Stems glabrous or nearly so; leaf-blades ovate, rounded or truncate at base, all on long petioles..1. *C. grande.*
Stems with spreading hairs; leaf-blades linear-oblong or linear-oblanceolate, the upper sessile or partly clasping by a rounded or auriculate base...2. *C. occidentale.*

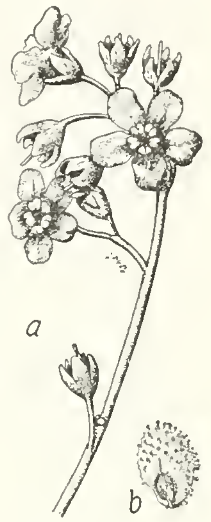

Fig. 411. CYNOGLOSSUM GRANDE Dougl. *a*, fl. branchlet, × 1; *b*, nutlet, × 1½.

1. **C. grande** Dougl. WESTERN HOUND'S TONGUE. (Fig. 411.) Stems erect, glabrous, 1 to 3 feet high; leaves mostly basal or borne on the lower part of the stem, the blades ovate, glabrous above or very thinly hirsutulose, hirsutulose beneath, 3 to 8 inches long, the petioles (glabrous or spreading-hirsute) often as long; calyx-lobes narrowly oblong, obtuse, densely pubescent, 2 to 4 lines long; corolla 4 to 7 lines long, blue, the tube often purple, slightly longer than the elliptic lobes; crests thick, lunate; nutlets depressed.

Shady wooded cañons or in chamise on dry slopes, 10 to 2500 (or 5000) feet: Coast Ranges (mostly in the outer range) from San Luis Obispo Co. to Siskiyou Co. (common); Sierra Nevada foothills from Tulare Co. to Butte Co. (infrequent). North to Washington. Mar.-May.

Locs.—Coast Ranges: Santa Margarita, San Luis Obispo Co., *Condit;* Pacheco Pass (w.), *Hoover* 2775; Loma Prieta, Santa Cruz Mts., *Davy* 467; Los Buellis Hills, Mt. Hamilton Range, *R. J. Smith* 20; Stanford, *C. F. Baker* 298; Strawberry Cañon, Berkeley, *Jepson;* Gates Cañon, Vaca Mts., *Jepson* 21,073; St. Helena, *Mary Pond;* Ukiah, *Purdy;* Bull Creek, South Fork Eel River, *Constance* 831; Crane Creek near Rosewood, w. Tehama Co., *Jepson;* Humboldt Hill, near Eureka, *Tracy* 1047; Forest Glen, Trinity Co., *Jepson;* Elk Creek sta., Del Norte Co., *R. Van Deventer* 57; Humbug, Siskiyou Co., *Butler* 594. Sierra Nevada foothills: Cedar Creek, Tulare Co., *Jepson* 618; betw. Oak Flat and Badger, Tulare Co., *H. P. Kelley;* Columbia, Tuolumne Co., *A. L. Grant* 645; Auburn, *Sonne;* Butte Creek, Butte Co., *C. C. Bruce.*

Refs.—CYNOGLOSSUM GRANDE Dougl.; Lehm., Pugill. 2:25 (1830), "Am. bor. occid."; Jepson, Fl. W. Mid. Cal. 450 (1901), ed. 2, 351 (1911), Man. 838 (1925). *C. laeve* Gray, Syn. Fl. 2:188 (1878), type loc. Plumas Co., *M. E. P. Ames. C. grande* var. *laeve* Gray, l.c. ed. 2, 2:421 (1886). *C. austinae* Eastw., Bull. Torr. Club 32:203 (1905), type loc. Butte Creek, Butte Co., *C. C. Bruce.*

2. **C. occidentale** Gray. Sierra Hound's Tongue. (Fig. 412.) Stems erect, leafy, 1 to several from the root-crown, 1 to 1½ feet high; herbage hirsute, the hairs recurving or spreading, the leaves often velvety; leaves 2 to 8 inches long, the blades linear-oblong or linear-oblanceolate (mostly ¾ to 1½ inches wide), the upper sessile or clasping by a rounded or auricular base, the lower narrowed to short petioles; basal or sub-basal leaves long-petioled, the lowermost represented by narrowly lanceolate scale-like organs; flowers somewhat capitate in a small terminal roundish cymose panicle or the panicle sometimes a little elongated; calyx-lobes linear to lanceolate, obtuse, 2 to 3 times longer than the tube; corolla brownish-pink, drying greenish, 4 to 4½ lines long, the cylindric tube abruptly expanded into a dilated throat, equaling or slightly longer than the calyx-lobes and 2 to 3 times as long as the corolla-lobes; crests tongue-like, retuse or obtuse; nutlets almost globular, 4 lines long.

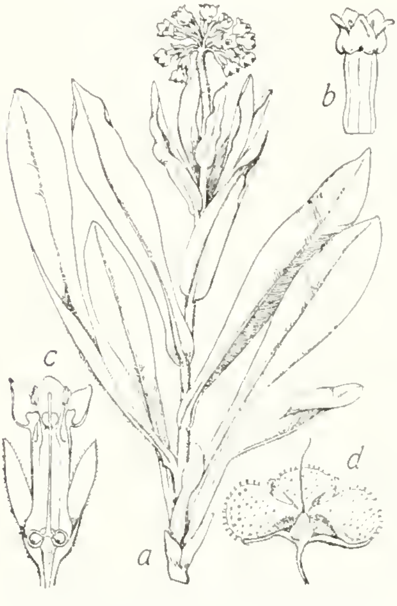

Fig. 412. Cynoglossum occidentale Gray. *a*, habit, × ¼; *b*, corolla, × 1½; *c*, long. sect. of fl., × 2; *d*, fr., × 1.

Moist open woods or in thickets on mountain slopes or flats, 4000 to 7000 feet: Sierra Nevada from Kern Co. to Modoc and Shasta Cos.; North Coast Ranges from Humboldt and Trinity Cos. to western Siskiyou Co. North to eastern Oregon. May-July.

Locs.—Sierra Nevada: Freeman Creek, Kern River, Tulare Co., *Jepson* 4882; Little Kern River near Deep Creek, *Jepson* 4912; betw. Colony Mill and Marble Fork Kaweah River, *Jepson* 657; Huntington Lake, *A. L. Grant* 1476; Hodgdon ranch, near Tuolumne Grove, *Jepson* 10,547; Center Camp, betw. Yankee Hill and Confidence, Tuolumne Co., *A. L. Grant* 762; betw. Brightman Flat and Eagle Mdw., Tuolumne Co., *Hoover* 3693; Myers sta., Eldorado Co., *Ottley* 977; Sierra Valley, *Lemmon;* Jonesville, Butte Co., *Copeland;* Goose Valley, ne. Shasta Co., *Baker & Nutting;* Forestdale, Modoc Co., *M. S. Baker;* Mt. Shasta, *Jepson* 21,074. North Coast Ranges: Brannan Mt., n. Humboldt Co., *Tracy* 3424; Coffee Creek, Salmon Mts., n. Trinity Co., *Hall* 8632; Sisson, *Jepson* 21,075; Highland Mine, w. Siskiyou Co., *Butler* 940.

Refs.—Cynoglossum occidentale Gray, Proc. Am. Acad. 10:58 (1874), type from the "Sierra Nevada in ne. part of Cal.," *Burgess;* Jepson, Man. 838 (1925). *C. viride* Eastw., Proc. Cal. Acad. ser. 2, 6:428, pl. 59 (1896) type loc. "Sequoia Mills" (now Millwood), Fresno Co., *Eastwood;* the herbage is densely puberulent but several collections exhibit intergradational states to the ordinary hirsute form of C. occidentale.

5. **LAPPULA** Moench. Stick-seed

Tall leafy-stemmed herbs; herbage pubescent or hispid. Flowers medium-sized or small, blue, white or sometimes pink, disposed in a panicle or cluster of racemes. Leaves entire, the upper sessile, the lower tapering to a winged petiole. Calyx 5-parted. Corolla rotate or short-salverform, the throat more or less closed with saccate crests. Nutlets large, bur-like, keeled ventrally, flattened on the back, armed with much-flattened barbed spines or prickles which are usually lance-acuminate or subulate in shape and set in a row on a distinct margin or over the entire back.—Species about 54, all continents. (Diminutive of the Latin lappa, a bur.)

Annuals; racemes leafy-bracteate throughout, the bracts small or even minute; calyx in fruit longer than the pedicels; pedicels in fruit remaining erect; nutlets united ⅘ of the way up by the ventral keel to the slender gynobase; transmontane deserts.

Dorsal area of nutlets bordered by a row of prickles, the margin not thickened or scarcely so.... 1. *L. redowskii.*

Dorsal area of nutlets with its margin annular-inflated, the ring bearing a few prickles.......... 2. *L. texana.*

Perennials, the stems from a thick root-crown; racemes leafy-bracteate only at base, the bracts above the base minute; calyx in fruit shorter than the pedicels; pedicels in fruit recurving or deflexed; nutlets united half-way up by the ventral keel to the pyramidal gynobase.

Dorsal face of the nutlets minutely papillate or naked or beset with a few very short (¼ to ½ line) scattered prickles, its border armed with a row of conspicuously flattened prickles.

Racemes several to many, borne in the leaf-axils along the upper part of the stem and thus forming a panicle; blades of basal leaves long-oblong to lanceolate, oblanceolate or linear, their pubescence dense or thin.

Corolla blue, the limb 1½ to 6 lines broad, the tube not exceeding the calyx.

Corolla 3 to 4 lines broad; marginal prickles of nutlets united at base to form a narrow wing, rarely a few prickles distinct.

Herbage hispid with spreading hairs; stamens inserted about middle of corolla-tube; corolla 4 lines broad; North Coast Ranges and Sierra Co..3. *L. setosa.*

Herbage strigose or mostly so; stamens inserted above middle of corolla-tube; corolla 3 lines broad; transmontane in Lassen and Modoc Cos..4. *L. arida.*

Corolla mostly 1½ to 3 lines broad; stamens inserted on upper part of corolla-tube.

Leaves thinly soft-pubescent; corolla usually 2 to 3 (or 4) lines broad; marginal prickles of nutlets united at base to form a narrow wing; Sierra Nevada and North Coast Ranges................5. *L. floribunda.*

Leaves densely roughish-puberulent; corolla 1½ to 2 lines broad; marginal prickles of nutlets distinct to base or nearly so; White Mts........... 6. *L. coerulescens.*

Corolla white, the limb 6 to 9 lines broad, the tube 1½ to 2 times as long as the calyx; stamens inserted on lower part of corolla-tube; North Coast Ranges. 7. *L. bella.*

Racemes 2 or 3, terminal and umbellately erect, or sometimes only 1; blades of basal leaves elliptic or elliptic-ovate, the scattered minute short hairs arising from minute dark dots; Mt. Whitney region..8. *L. sharsmithii.*

Dorsal face of the nutlets beset all over with prickles, the prickles 1½ to 2½ lines long at maturity, less broadly dilated.

Corolla white, the limb 3 to 6 lines broad, the tube not exceeding the calyx......................... 9. *L. californica.*

Corolla blue or sometimes pink, the tube 1½ to 2 times as long as the calyx.

Limb of corolla 5 to 7 lines broad; corolla-crests hairy; leaves velvety-pubescent...... 10. *L. velutina.*

Limb of corolla 3 to 4 lines broad; corolla-crests papillate-roughened but not hairy; leaves thinly hispidulose, the hairs arising from minute dark pits or half-craters..11. *L. nervosa.*

1. **L. redowskii** Greene. Stems 1 or few from the base, erect or diffuse, paniculately branched above, 8 to 14 inches high; herbage puberulent and spreading-hirsute; leaf-blades linear to very narrowly lanceolate, ¼ to 1¼ inches long, sessile or the lower and basal narrowed into petioles ¼ to as long; racemes bracteate with very small leaves; calyx longer than the pedicels, the narrowly lanceolate segments not recurved in fruit; corolla blue, 1½ to 1¾ lines long, the tube a little shorter than the calyx, the throat with conspicuous crests; stamens inserted about middle of corolla-tube; nutlets 1 to 1¼ lines long, the dorsal area ovate, sharply tuberculate, bordered by a single row of barbed prickles, the prickles distinct at base or sometimes joined by a narrow margin.

Arid mountain valleys and hillslopes, in open or brushy country, 4000 to 7000 feet: San Bernardino Mts. (north slope or northerly plateaus); east side of the Sierra Nevada from Inyo Co. to Modoc Co. North to Alaska and Saskatchewan, east to Colorado, south to Mexico. Europe, Asia, north Africa. May-Aug.

Locs.—San Bernardino Mts.: Holcomb Valley, *Hall* 1052; Bear Valley, *Parish* 1469. East side of the Sierra Nevada: Silver Cañon, White Mts., *Jepson* 7230; Fales Hot Sprs., Mono Co., *Ottley* 1041; Beckwith Pass, Lassen Co., *Jepson* 7765; Goose Valley, Modoc Co., *R. M. Austin;* Fort Bidwell, *Manning* 170.

Refs.—LAPPULA REDOWSKII Greene, Pitt. 2:182 (1891). *Myosotis redowskii* Hornem., Hort. Hafn. 1:174 (1813), type from Asia. *Echinospermum redowskii* Lehm., Asperif. 127 (1818).

Both Brand (in Engler, Pflzr. 4^{252}:146,—1931) and Johnston (Contrib. Arn. Arb. 3:94,—1932) hold that our west American plant differs in no wise from the plant of Asia, wherefore the following synonyms: *Echinospermum redowskii* var. *occidentale* Wats., Bot. King 246, pl. 23, figs. 9–10 (1871), "frequent . . . Sierras to Wasatch." *L. occidentalis* Greene, Pitt. 4:97 (1899); Jepson, Man. 839 (1925).

2. **L. texana** Britt. Stem erect, branched from or near the base with ascending branches, 6 to 11 inches high; herbage spreading-hirsute and thinly pubescent; leaf-blades linear to oblong, obtuse, 4 to 12 lines long, sessile, the lowest oblanceolate and narrowed to short petioles; calyx as long or longer than corolla-tube; corolla light blue, 1 to 1½ lines long, 1 line broad; stamens inserted about middle of corolla-tube or a little above; nutlets finely tuberculate, 1¼ lines long, the margin strongly annular-inflated, this ring (or raised border) bearing a row of prickles on its inner side next the dorsal area.

Desert mesas, 4000 to 5000 feet: eastern Mohave Desert; east side of the Sierra Nevada in Sierra Co. East to Nevada, Texas and Nebraska, north to Idaho. Mar.-Apr.

Locs.—Mohave Desert: Needles, *Lemmon;* Barnwell, New York Mts., *K. Brandegee.* Sierra Co.: Peavine, *K. Brandegee.*

Refs.—LAPPULA TEXANA Britt., Mem. Torr. Club 5:273 (1894); Jepson, Man. 839 (1925). *Echinospermum texanum* Scheele, Linnaea 25:260 (1852), type loc. San Antonio, Tex., *Roemer. E. redowskii* var. *cupulatum* Gray, Bot. Cal. 1:530 (1876), type loc. "along the eastern side of the Sierra Nevada," *Watson,* more specifically Trinity Mts., Nev., acc. *Piper,* Contrib. U. S. Nat. Herb. 11:475. *L. cupulata* Rydb., Bull. Torr. Club 28:31 (1901). *L. redowskii* var. *desertorum* Jtn., Contrib. Arn. Arb. 3:93 (1932), at least in part.

LAPPULA ECHINATA Gilib., Fl. Lithuan. 25 (1781), type European. Annual, similar to L. texana; nutlets densely tuberculate, armed with a double row of barbed prickles along the margin.—Adventive at Santa Monica and Upland, acc. *P. A. Munz.*

3. **L. setosa** Piper. Stems 1 or 2 from the root-crown, erect, 1½ to 2½ feet high; herbage uniformly setose-hispid with spreading or ascending white hairs; leaves in a basal tuft and also rather dense on lower part of stem, the blades linear, 1½ to 4½ inches long, the cauline sessile, the sub-basal and basal narrowed to petioles ¼ to ½ as long; panicle narrow or broad; calyx-lobes linear or spatulate, as long as corolla-tube; corolla blue, 4 lines broad, its crests tuberculate; nutlets 2 lines long, the dorsal face minutely papillate and with several scattered very short prickles; marginal prickles very unequal, a little united at base to form a thin narrow wing, or some bristles on a nutlet distinct.

Openly wooded ridges or slopes, 1300 to 5200 feet: northern Sierra Nevada in Sierra Co.; North Coast Ranges from northern Lake Co. to western Siskiyou Co. North to southern Oregon. June-July.

Locs.—Sierra Co.: Sierra Valley. North Coast Ranges: Snow Mt., n. Lake Co. (Bull. Torr. Club 29:544); French Gulch, w. Shasta Co., *Blasdale;* Siskiyou Mts. (Bull. Torr. Club 29:544).

Refs.—LAPPULA SETOSA Piper, Bull. Torr. Club 29:544 (1902), type loc. Sierra Valley, *Lemmon. Hackelia setosa* Jtn., Contrib. Gray Herb. 68:46 (1923).

4. **L. arida** Piper var. **cusickii** Nels. & Mcbr. Stems erect, slender, 1 or few from the simple or branched crown of a slender taproot, 9 to 16 inches high; herbage densely strigose; leaves mostly in a basal tuft, the blades lanceolate, 1 to 2½ inches long, 2 to 4 (or 5) lines wide, gradually narrowed to a petiole ½ to as long; bases of petioles densely spreading-hirsute or retrorsely hirsute, grayish; cauline leaves similar, sessile or subsessile, reduced upwards; panicle with rather few spreading branches; corolla blue, 2 to 2½ lines long, 3 lines broad, its tube not exceeding the calyx; nutlets ovate, 2 lines long, the lanceolate prickles very unequal, united at base to form a narrow wing; dorsal surface set with a few short prickles.

Dry hills, 4000 to 6500 feet: Lassen Co. to Modoc Co. North to Oregon. May-July.

Locs.—Dixey Mts., Lassen Co., *Baker & Nutting;* Bonner Grade near Cedarville, Modoc Co., *Stebbins* 1818; Steamboat Cañon, Warner Mts., *E. H. Frost* 42.

Refs.—LAPPULA ARIDA Piper, Bull. Torr. Club 28:44 (1901), type loc. Ellensburg, Wash., *Piper* 2676. Var. CUSICKII Nels. & Macbr., Bot. Gaz. 61:41 (1916). *L. cusickii* Piper, Bull. Torr. Club 29:542 (1902), type loc. Logan Mts., e. Ore., *Cusick* 2623. *Hackelia arida* var. *cusickii* Jtn., Contrib. Gray Herb. 68:48 (1923). *H. cusickii* Brand; Engler, Pflzr. 4^{252}:131 (1931).

5. **L. floribunda** Greene. Stem erect, 2 to 3¼ feet high; herbage soft-pubescent; leaf-blades oblong to oblong-lanceolate, 2 to 8 inches long, the cauline leaves usually sessile, the basal leaves drawn down to a petiole ⅓ to as long as the blade; pedicels in fruit deflexed, 1 to 4 lines long; calyx-lobes ovate or oblong, about as long as corolla-tube; corolla blue, 2 to 3 (or 4) lines broad; nutlets 2 lines long, the dorsal face ovate-triangular, minutely papillate, naked or with 1 to 3 (or 6) very short bristles, commonly with a median nerve, its margin with a row of conspicuous long spines and usually with several extremely short intervening ones, all united at base into a very narrow wing.

Mountain slopes, 3500 to 5000 feet: Warner Mts., Modoc Co. East to New Mexico and Colorado, north to Washington and Saskatchewan. June-July.

Geog. note.—Lappula floribunda is found throughout the Rocky Mountains in the United States, a representation of the species which is marked by large corollas. This large-flowered condition is found in California only in the Warner Mountains of eastern Modoc Co. (Lake City Cañon, *R. M. Austin & C. C. Bruce* 2268). The prevailing form of the species in California is consistently small-flowered but does not differ in any other particular from the formal type of the species in Colorado. It is here listed as follows:

Var. **jessicae** (MacGregor) Jepson & Hoover comb. n. Corolla 1½ to 2 lines broad.—Moist meadows, damp slopes or in dry woods on ridges, montane, 4500 to 8500 (or 11,500) feet: Sierra Nevada from eastern Siskiyou Co. to Tulare Co.; North Coast Ranges from western Siskiyou Co. to Humboldt Co.

Locs.—Medicine Lake, e. Siskiyou Co., *M. S. Baker;* Lincoln Valley, se. Sierra Co., *Kennedy & Doten* 229; Brokeoff Mt., ne. Tehama Co., *J. Grinnell;* Big Mdws., Plumas Co., *Platt;* Summit sta., Nevada Co., *Jepson* 21,087; Fallen Leaf Lake, Eldorado Co., *M. S. Baker;* Chipmunk Flat, Alpine Co., *Yates* 5330; Deadman Creek, near Sonora Pass, *Jepson* 6579; Lake Merced, Merced River, *Jepson* 4412; Palisade Creek, Middle Fork Kings River, *E. Ferguson* 503; Ruby Lake, Rock Creek, w. Inyo Co., *Peirson* 9132; Alta Mdws., Tulare Co., *K. Brandegee;* Rock Creek, upper Kern River, *Hall & Babcock* 5524. Coast Ranges: Whiskey Camp, Independence Creek, w. Siskiyou Co., *Butler* 13; Devil's Hole, Trinity Summit, *Tracy* 10,691; South Fork Mt., Trinity Co., *Tracy* 12,755.

Var. **geisiana** Jepson. Cauline leaves long-oblong, those of the inflorescence ovate, acute, with cordate-clasping base; nutlets 2½ lines long.—Placer Co.; Siskiyou Co. (upper Wright Lake, *Hart* 896).

Refs.—LAPPULA FLORIBUNDA Greene, 2:182 (1891); Jepson, Man. 840 (1925) in part. *Echinospermum floribundum* Lehm., Pugill. 2:24 (1830); Hook., Fl. Bor. Am. 2:84, t. 164 (1838), "Lake Pentanguishene to the Rocky Mts.," *Drummond. Hackelia floribunda* Jtn., Contrib. Gray Herb. 68:46 (1923). *Echinospermum deflexum* var. *americanum* Gray, Proc. Am. Acad. 17:224 (1882), type loc. not given. Var. JESSICAE Jepson & Hoover. *L. jessicae* MacGregor, Bull. Torr. Club 37:262, fig. 2 (1910), type loc. Half Moon Lake, Eldorado Co., *MacGregor* 71. *Hackelia jessicae* Brand, Pflzr. 4^{252}:132 (1931). *Lappula micrantha* Eastw., Bull. Torr. Club 30:497 (1903), type loc. Twin Lakes, Trinity Co., *Eastwood;* not Hackelia micrantha Opiz, wherefore *Hackelia eastwoodae* Jtn., Contrib. Gray Herb. 68:47 (1923). *L. floribunda* Jepson, Man. 840 (1925) in great part. Var. GEISIANA Jepson, Man. 840 (1925), type loc. Crags Slope, Deer Park, near Lake Tahoe, *Geis* 215 (typ. in Herbario Jepsoniano).

6. **L. coerulescens** Rydb. var. **brevicula** Jepson var. n. Stems 2 or 3, strictly erect from a compactly branched root-crown; petioles and lower portion of stems deflexed-hirsute; leaves mostly in a basal tuft, 3 to 5½ inches long, the linear-lanceolate blades about equaling or a little longer than the petioles; leaf-blades densely roughish-puberulent or somewhat felt-like; pedicels uniformly short (about 1 line long); calyx equaling corolla-tube; corolla blue, 1½ to 2 lines broad; stamens inserted on upper part of corolla-tube; marginal prickles of nutlets rather short, the dorsal face quite naked.—(Folia scaberulo-puberulentia; pedicelli breves (circa 1 lin. longi); calyx tubum corollae aequans; nuculae aculeis marginalibus subbrevibus, facie exteriore nuda.)

Dry "bottoms" of creeks, 10,000 feet: White Mountains, Mono Co. July.

Loc.—Poison Creek, *Jepson* 7374 (type). The pedicels elongate little in age; they are ½ to ¼ as long as in the species.

Ref.—LAPPULA COERULESCENS Rydb., Mem. N. Y. Bot. Gard. 1:328 (1900), type loc. Bridger Mts., Mont., *Rydberg & Bessey* 4898. Var. BREVICULA Jepson.

7. **L. bella** Mcbr. Stem erect, 1½ to 2¾ feet high; herbage finely appressed-pubescent; leaf-blades 1½ to 8 inches long, oblong to linear or the upper oblong-lanceolate, all sessile save the basal and sub-basal, these on petioles ⅕ to nearly as long; uppermost leaves ovate, acute, short, sessile by a cordate base, 1½ to 3¾ inches long; basal leaves oblanceolate; pedicels recurved in fruit; calyx-lobes ovate, obtuse, ½ to ¾ as long as corolla-tube, reflexed in fruit; corolla white, 6 to 9 lines broad, the crests finely pubescent; stamens inserted on lower part of corolla-tube; nutlets 2½ lines long, the dorsal area minutely papillate but naked or sometimes with a few very short scattered prickles, its border armed with a row of prickles, the prickles not confluent at base or some of the prickles slightly and unequally united at base.

Open slopes, montane, 4000 to 6500 feet: Coast Ranges from Mendocino Co. to southern Siskiyou Co. June-July.

Locs.—Lasseck Peak, Humboldt Co., *Goddard* 677; Soldier Ridge, se. Trinity Co., *Jepson* 21,088 (det. R. F. Hoover); Buck Mt., Humboldt Co., *Tracy* 4174; Eight-mile Ridge, South Fork Mt., Trinity Co., *Tracy* 12,741; Salmon Summit, n. end Devils Backbone, sw. Siskiyou Co., *Tebbe* 133.

Refs.—LAPPULA BELLA Mcbr., Contrib. Gray Herb. 48:39 (1916), type loc. Dorleska, Trinity Co., *Hall* 8599; Jepson, Man. 840 (1925). *Hackelia bella* Jtn., Contrib. Gray Herb. 68:47 (1923). *L. rattanii* Brand; Fedde, Repert. Sp. Nov. 18:311 (1922), type loc. Mendocino Co., *Rattan* 45. *Hackelia rattanii* Brand; Engler, Pflzr. 4^{252}:129 (1931).

8. **L. sharsmithii** (Jtn.) Jepson & Bailey comb. n. Stems several, erect or ascending, thinly retrorse-hirsutulose, 6 to 12 inches high, these and the basal leaves tufted on a branched root-crown, the root-crown branches densely sheathed by old stem and leaf bases; herbage bright green, the leaves microscopically strigulose, the hairs with black dots at base; leaf-blades elliptic or elliptic-ovate, 1 to 2¾ inches long, rather abruptly petioled, the petioles 1 to 2¼ inches long; cauline leaves reduced upwards, the upper ones sessile or subsessile, rounded or subcordate at base; racemes 2 or 3, loose, borne in a terminal erect cluster; corolla blue, 2 to 3 lines long, 3 to 3½ lines broad, its tube scarcely exceeding the calyx; pedicels recurved in fruit, becoming 6 lines long; nutlets ovate, 1½ lines long, bordered by a row of triangular-acute prickles, these distinct or partly united to form a narrow wing; dorsal surface set with 1 to several short prickles.

Between moist rocks and under shelter of granite boulders, 11,000 to 12,000 feet: Sierra Nevada, east side or high easterly plateaus in the Mount Whitney region, Tulare and Inyo Cos. Aug.

Endemism note.—Lappula sharsmithii, localized in the region of Mount Whitney at high altitudes, has a longitudinal range of about 8 miles. Both in leafage and inflorescence it is a remarkable species. First collected on Mt. Whitney in 1895 by C. A. Purpus, his material (no. 1620), scanty and depauperate, reveals only obscurely the true character of the species. It was only through ample recent collections that the peculiar validity of this high-montane endemic became obviously apparent. The known stations, all by the same collector, are as follows: Mirror Lake, Lone Pine Cañon; Consultation Lake, *Sharsmith* 3280; Mt. Muir (e. of), *Sharsmith* 3336; Siberian Outpost (plateau sw.), Tulare Co., *Sharsmith* 3415.

Refs.—LAPPULA SHARSMITHII Jepson & Bailey. *Hackelia sharsmithii* Jtn., Jour. Arn. Arb. 20:398 (1939), type loc. above Mirror Lake, Lone Pine Cañon, Inyo Co., *Sharsmith* 3354 (isotyp. vidimus).

9. **L. californica** Piper. Stems erect, 1½ to 3 feet high; herbage appressed-pubescent or the hairs partially spreading on the stems and petioles; leaf-blades oblong (or some upper ones lanceolate), 2½ to 5½ inches long, sessile, the lower cauline and basal tapering to a petiole ¼ to as long; panicles usually large and widely branched; calyx-lobes ovate, about equaling the corolla-tube; corolla white

(sometimes drying lavender), 3 to 6 lines broad; stamens inserted about middle or somewhat above middle of corolla-tube; nutlets 2½ lines long, the ovate dorsal face beset with prickles.

Open pine forests, montane ridges or flats, 5000 to 7900 feet: North Coast Ranges from Lake Co. to Humboldt Co.; Sierra Nevada from Alpine Co. to Modoc Co. and eastern Siskiyou Co. North to Oregon. June-July.

Locs.—Coast Ranges: Snow Mt., n. Lake Co., *Purpus* 1167; South Fork Mt., e. Humboldt Co., *Tracy* 9024; Corral Prairie, Trinity Summit, *Tracy* 10,428. Sierra Nevada: Red Lake, Alpine Co., *Peirson* 11,618; Jonesville, Butte Co., *Heller* 11,657; Feather River Mdws., near Rice Creek, n. Plumas Co., *Jepson* 12,281; Camp Lee, Warner Creek, n. Plumas Co., *Jepson* 12,310; Hot Springs Valley, Lassen Peak, *Jepson* 4078; Mineral, e. Tehama Co., *J. Grinnell;* Forestdale, sw. Modoc Co., *M. S. Baker;* Medicine Lake, e. Siskiyou Co., *M. S. Baker;* Fowlers Camp, McCloud River, se. Siskiyou Co., *Jepson* 20,065.

Var. **mundula** Jepson var. n. Corolla pink-red.—(Corolla punicea.)—Open white fir woods, near Long Mdw., n. Tulare Co., *Jepson* 720 (type). Its geographic isolation, in connection with intangible differences in aspect, lends this form some significance.

Refs.—LAPPULA CALIFORNICA Piper, Bull. Torr. Club 29:546 (1902); Jepson, Man. 840 (1925). *Echinospermum californicum* Gray, Proc. Am. Acad. 17: 225 (1882), type loc. Mt. Shasta, *Pringle* (typ. vidi), (cf. Bull. Torr. Club 29:546). *Hackelia californica* Jtn., Contrib. Gray Herb. 68:47 (1923). Var. MUNDULA Jepson.

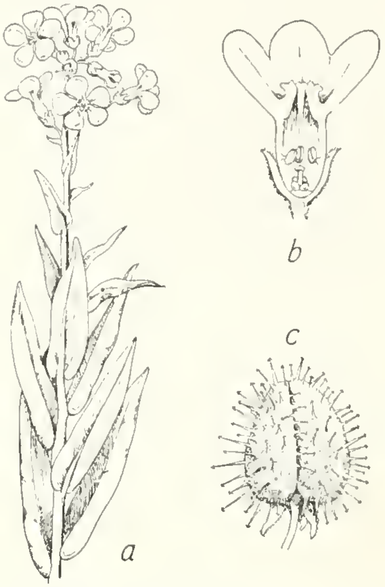

Fig. 413. LAPPULA VELUTINA Piper. *a*, fl. branchlet, × ½; *b*, long sect. of fl., × 2; *c*, fr., × 3.

10. **L. velutina** Piper. (Fig. 413.) Stems erect, 1 to 2 feet high; herbage silky or velvety-pubescent; leaves 1 to 6 inches long, the blades oblong to linear (rarely ovate or lanceolate), the upper sessile or subauriculately clasping, the lower and basal on petioles ½ to as long; panicles compact, medium-sized, becoming large and spreading in fruit; calyx-lobes ovate, obtuse, half as long as the corolla-tube; corolla blue, or blue changing to pink, or sometimes pink, the limb 5 to 7 lines broad, the crests conspicuous, white or whitish, densely white-hairy on the upper surface, recurved and notched at apex, ⅓ as long as the corolla-lobes; stamens inserted about middle or a little above middle of corolla-tube; nutlets with the dorsal face beset and bordered with prickles.

Dry open woods, montane, 5000 to 8500 feet: Sierra Nevada from Tehama Co. to Tulare Co. June-July.

Locs.—Mineral, e. Tehama Co., *J. Grinnell;* Gold Lake, Sierra Co., *Lemmon;* betw. Emigrant Gap and Blue Cañon, Placer Co., *K. Brandegee;* Fallen Leaf Lake, Eldorado Co., *Ottley* 835; betw. Myers sta. and Angora Ridge, Eldorado Co., *Ottley* 972; Dorrington, Calaveras Co., *Jepson* 10,053; Silver Lake, Amador Co., *Hansen* 427; Sugar Pine, Tuolumne Co., *Chesnut & Drew;* Mammoth, sw. Mono Co., *K. Brandegee;* Rancheria Mt., above Hetch-Hetchy, *Jepson* 3402; Hodgdon ranch, near Tuolumne Grove, *Jepson* 10,552; Mariposa Grove, *Bolander* 4882; betw. Tehipite Valley and Gnat Mdw., Middle Fork Kings River, *E. Ferguson* 530; Andrews Camp, Bishop Creek, Inyo Co., *K. Brandegee;* Long Mdw., near Mt. Silliman, Tulare Co., *Jepson* 720; Mt. Moses, Tulare Co., *Purpus* 1454.

Refs.—LAPPULA VELUTINA Piper, Bull. Torr. Club 29:546 (1902), type loc. Grant Park, Fresno Co., *T. Brandegee;* Jepson, Man. 840 (1925). *Hackelia velutina* Jtn., Contrib. Gray Herb. 68:47 (1923).

11. **L. nervosa** Greene. Stems few, erect, 1 to 1½ feet high, glabrous or thinly spreading-hirsute; leaves thinly hispidulose, the hairs arising from dark pits or half-craters; leaf-blades oblong-ovate to oblong-spatulate or oblong, 1 to 3½ inches

long, the cauline leaves sessile or the lower cauline and the basal ones narrowed to petioles $\frac{1}{5}$ to nearly as long; calyx-lobes ovate, obtuse, $\frac{1}{2}$ as long as the corolla-tube; corolla blue, or rarely pink, the limb 3 to 4 lines broad, the throat with small crests only $\frac{1}{6}$ as long as the lobes; stamens inserted on upper part of corolla-tube; nutlets 2 to $2\frac{1}{2}$ lines long, the dorsal area broadly ovate, discretely covered with prickles.

Flats and slopes, montane, 5000 to 8500 feet: Sierra Nevada from Fresno Co. to Plumas Co. June-July.

Locs.—Kaiser Crest, Fresno Co., *A. L. Grant* 4343; Snow Creek, Yosemite, *Jepson* 10,491; Harden Lake, s. side of Grand Cañon of the Tuolumne, *A. L. Grant* 1275; Matterhorn Cañon, se. Tuolumne Co., *Jepson* 4501; Rancheria Mt., above Hetch-Hetchy, *Jepson* 4583; Calaveras Grove, *A. L. Grant;* Carson Spur, Alpine Co., *Hansen* 726; Castle Peak, Nevada Co., *Sonne;* Butte Creek House, Butte Co., *H. F. Copeland;* Kings Valley, se. of Lassen Peak, n. Plumas Co., *R. M. Austin* 359; Mineral (4 mi. n.), Tehama Co., *J. Grinnell;* Brokeoff Mt., ne. Tehama Co., *J. Grinnell.*

Refs.—LAPPULA NERVOSA Greene, Pitt. 2:182 (1891); Jepson, Man. 840 (1925). *Echinospermum nervosum* Kell., Proc. Cal. Acad. 2:146, fig. 42 (1862), type loc. headwaters of Carson River, Alpine Co., *Gibbs. Hackelia nervosa* Jtn., Contrib. Gray Herb. 68:47 (1923).

LAPPULA ECHINATA Gilib., Fl. Lith. 1:25 (1781). Branching annual; herbage strigose and hispid; leaves linear or oblong; racemes leafy-bracteate; corolla bright blue, $1\frac{1}{2}$ lines broad; nutlets papillate dorsally and furnished with 2 rows of marginal prickles.—Adventive at Upland, San Bernardino Valley (Bull. S. Cal. Acad. 24:50,—1925). Native of Europe and Asia.

6. **PECTOCARYA** DC.

Low slender obscure annuals with strigose pubescence and narrowly linear leaves. Flowers minute ($\frac{1}{2}$ to 1 line long), white, on very short pedicels, scattered along the stems or branches. Calyx deeply 5-cleft, spreading or reflexed in fruit. Corolla with a circle of processes or crests which almost close the throat. Stamens included. Nutlets flat, thin, equably radiate-divergent or divergent in pairs, bordered at apex or all around the margin with a row of bristles hooked at tip.—Species 6, North and South America. (Greek pectos, combed, and karua, nut, on account of the row of bristles on the nutlet.)

Nutlets about equably divergent, not winged, cuneate-rhomboid or obovate-rhomboid, the acute margin bordered all around by bristles; calyx hispidulose and uncinate-bristly at tip of lobes, in fruit longer than the nutlets; Coast Ranges and Sierra Nevada foothills............ 1. *P. pusilla.*

Nutlets borne in divergent pairs, bordered by a wing; calyx-lobes not uncinate-bristly at tip.

  Nutlets oblong or linear, the wing somewhat coriaceous, more or less beset with uncinate bristles, the body always destitute of uncinate bristles; calyx shorter than the nutlets.

    Wing undulate, deltoid-toothed, erosulate or entire, not cleft, the apex thickly beset with slender bristles, the sides naked or furnished with a few similar bristles; throughout Cal.

      Wing markedly incurved at middle of nutlet, commonly not bristly at middle............ 2. *P. penicillata.*

      Wing not incurved at middle of nutlet, the sides scattered-bristly or sometimes naked............3. *P. heterocarpa.*

    Wing parted or cleft all around into triangular or subulate teeth, the teeth ending in slender bristles.

      Nutlets not recurved (sometimes incurved), the body linear-oblong, the teeth of the wing triangular or with broad base; cent. and S. Cal.........4. *P. linearis.*

      Nutlets strongly recurved, the body linear, the teeth of the wing subulate; transmontane deserts............5. *P. recurvata.*

  Nutlets (or always some of them) orbicular, the wing thin-scarious, entire or obscurely undulate, both the body and (commonly) the wing beset with uncinate bristles; calyx in fruit longer than the nutlets; transmontane deserts (also intramontane in S. Cal.) and South Coast Ranges............6. *P. setosa.*

1. **P. pusilla** Gay. Stem erect, somewhat flexuous, simple or sparingly branched, 3 to 8 inches high, sometimes the branches many from the base and diffuse in age; herbage strigulose; leaf-blades linear to oblanceolate, 2 to 7 lines long;

calyx hispidulose, the tips of the lobes with several uncinate bristles; nutlets 4 and equably divergent (or sometimes but 2), 1 line long, cuneate-rhomboid or obovate-rhomboid, carinately nerved on the upper face, not winged, the margin bearing a row of slender uncinate bristles.

Wooded or open slopes in the hills, 500 to 2800 feet: Coast Ranges from western Merced Co. and Santa Clara Co. to western Siskiyou Co.; Sierra Nevada foothills from Kern Co. to eastern Siskiyou Co. North to Washington. Also in Chile. Apr.-May.

Locs.—Coast Ranges: Pacheco Pass, *Hoover* 4024; Los Altos, 5 mi. w., in Santa Cruz Mts., *Keck* 4350; Portola, San Mateo Co., *Elmer* 4676; Mt. Diablo, *Bowerman* 2019; St. Helena (hills near), *Jepson* 21,091; Potter Valley, e. Mendocino Co., *Purpus* 34; Covelo ranger sta., Middle Eel River, e. Mendocino Co., *Duran* 3392; Three Forks of Mad River, Trinity Co., *Tracy* 10,180; Oro Fino, Siskiyou Co., *Butler* 614. Sierra Nevada foothills: Woody (¼ mi. se.), Greenhorn Mts., *C. N. Smith* 340; California Hot Sprs., Tulare Co., *Keck & Stockwell* 3327; Pinehurst, Fresno Co., *Newlon* 187; Piedra (e. of), Kings River Cañon, *Hoover* 3986; North Fork, Madera Co., *Bacigalupi* 2316; Mormon Bar, Mariposa Co., *Jepson* 12,776; Avery, Calaveras Co., *Tracy* 5718; Placerville, *K. Brandegee;* Stillwater, Shasta Co., *M. S. Baker*. In mature nutlets the margin is usually a little cord-like and the upper face sometimes microscopically hirsutulose.

Refs.—PECTOCARYA PUSILLA Gay, Fl. Chilena 4:482, t. 52, fig. 3 (1849); Jepson, Fl. W. Mid. Cal. 449 (1901), ed. 2, 351 (1911), Man. 841 (1925). *Gruvelia pusilla* A. DC., Prodr. 10:119 (1846), type from Chile, *Poeppig* 276. *P. chilensis* var. *californica* Torr., Pac. R. Rep. 4:124 (1857), type loc. Murphy's, Calaveras Co. (by error "Los Angeles"), *Bigelow*, May 14, 1854; other records in the same volume (Pac. R. Rep. 4:67, 68, 69, 72) show that on that date Bigelow was collecting at Murphy's. *P. pusilla* var. *flagellaris* Brand; Engler, Pflzr. 4^{252}:96 (1921), type loc. Klickitat Co., Wash., *Suksdorf* 410; "inflorescentiae longiores quam cetera pars plantae; . . . nuculae 2–4," whereas, the Chilean plant, says Brand, has shorter inflorescences and usually fewer nutlets than the North American plant, but Californian plants are highly variable in these respects and it is thought such differences are unimportant.

2. **P. penicillata** A.DC. Stems few or several from the base, diffuse, 1 to 8 inches high; leaf-blades filiform or linear, ¼ to 1¼ inches long; nutlets divergent in pairs, oblong, 1 to 1½ lines long, surrounded by a wing which is markedly developed at apex and incurved or subobsolete along the middle, and bears at the rounded apex a series or tuft of slender bristles hooked at the tip; middle of the wing naked or sometimes with a few bristles; bristles always slender, not dilated or triangular at base.

Sandy valleys, hillsides and cañon flats, 100 to 2000 (or 5000) feet: Coast Ranges; Great Valley; Sierra Nevada foothills from Madera Co. to Kern Co.; east side of the Sierra Nevada in Lassen Co.; Tehachapi Mts.; Mohave Desert; coastal Southern California; western Colorado Desert. South to Lower California, east to Arizona and Wyoming, north to British Columbia. Mar.-June.

Locs.—Coast Ranges: Junction City, Trinity Co., *Tracy* 6428; Paskenta (6 mi. w.), w. Tehama Co., *Virginia Bailey;* Sand Creek, sw. Colusa Co., *Hoover* 3220; Callayomi Valley, s. Lake Co., *Jepson* 17,418; Calistoga, *Jepson* 21,224; Lake Merced, San Francisco, *Tracy* 1813; Castle Rock, Corral Hollow, w. San Joaquin Co., *Jepson* 9592; Emmet, San Benito Co., *Jepson* 18,111; Old Tully School, Bitterwater Valley, s. San Benito Co., *Jepson* 16,140; Paso Robles, *Barber.* Great Valley: Stillwater Creek, Shasta Co., *M. S. Baker;* Crane Creek, w. Tehama Co., *Jepson* 21,090; College City, Colusa Co., *Alice King;* Chowchilla (8 mi. w.), Madera Co., *Hoover* 1680. Sierra Nevada foothills: Fresno Flats, Madera Co., *Jepson* 12,847; betw. Pinehurst and Badger, Fresno Co., *Newlon* 182; Weldon, Kern Co., *Voegelin* 94. Sierra Nevada, east side, in Lassen Co.: Beckwith Pass, *Jepson* 7770. Tehachapi Mts.: Rowen, *Jepson* 6731. Mohave Desert: Needles, *Jones;* Saltdale, *Jepson* 19,513a; Lancaster, *Jepson* 17,042; Fairmont, *Jepson* 19,233. Coastal S. Cal.: San Francisquito Cañon, n. Los Angeles Co., *Clokey* 4674; Santa Catalina Isl. (Erythea 7:143); Thomas Valley, San Jacinto Mts., *Jepson* 1323; Elsinore, sw. Riverside Co., *Jepson* 19,149; Oak Grove, San Diego Co., *Jepson* 19,203. Colorado Desert: Mason Valley, e. San Diego Co., *Jepson* 8720; Jacumba, se. San Diego Co., *C. V. Meyer* 429.

Refs.—PECTOCARYA PENICILLATA A.DC., Prodr. 10:120 (1846); Jepson, Fl. W. Mid. Cal. 449 (1901), ed. 2. 351 (1911), Man. 841 (1925). *Cynoglossum penicillatum* H. & A., Bot. Beech. 371 (1840), type from Cal., *Douglas*. *P. linearis* var. *penicillata* Jones, Proc. Cal. Acad. ser. 2, 5:709 (1895).

3. **P. heterocarpa** Jtn. Habit and size similar to P. penicillata; two nutlets narrower and unwinged or with narrow margins, the other two nutlets with rather

broad wings, the wings subequal all around, deltoid-toothed or erosulate or subentire, the apex with a series of slender bristles, the sides with few scattered bristles or none; nutlets on lower part of plant usually all unmargined.

Valley plains, low hills and desert mesas, 100 to 3000 feet: inner South Coast Range; upper San Joaquin Valley (mostly west side); Mohave and Colorado deserts; San Bernardino Valley. South to Lower California, east to Arizona. Apr.-May.

Tax. note.—In its nutlet Pectocarya heterocarpa seems to be consistently, although narrowly, distinct from Pectocarya penicillata. In Pectocarya penicillata, the wing of the nutlet is strongly incurved at the middle on each side with the incurved portion destitute of bristles, with the oblique apex densely bristly and the similar oblique base sparsely bristly or sometimes naked. In Pectocarya heterocarpa the wing is not incurved at the middle and is usually more or less scattered or weakly uncinate-bristly on the sides or sometimes naked. The dorsal keel is sometimes conspicuously and rather densely bristly (Painted Cañon, Mecca Hills, *Jepson* 11,647). As to the calyx-lobes, they are unequal in Pectocarya heterocarpa with the smallest lobe standing next to the axis; but similar unequal calyx-lobes may be found in Pectocarya penicillata.

Locs.—Inner South Coast Range: Crow Creek Cañon, w. Stanislaus Co., *Hoover* 4312; Panoche Valley, e. San Benito Co., *Jepson* 18,123; Carrizo Plain, se. San Luis Obispo Co., *Jepson* 16,216a. Upper San Joaquin Valley: Hayes sta., nw. Fresno Co., *Jepson* 16,979a; Coalinga, *Jepson* 15,354; Kettleman City, Kings Co., *Hoover* 2915; Maricopa Hills, Kern Co., *Hoover* 3104; Bakersfield, *Davy* 1726. Mohave Desert: Neenach School, Antelope Valley, *Jepson* 19,236; Saltdale, *Jepson* 19,513a; Paradise Mts. (4½ mi. ne.), *Jepson* 20,329; Barstow, *Jepson* 5829; Essex, *Jepson* 18,162; Needles, *Jones*. Colorado Desert: Palo Verde Valley (Contrib. Gray Herb. 70:38); Thousand Palms Cañon, Conchilla Range, *Fosberg* 10,629; Mecca, *Parish* 8448; La Quinta Cañon, Santa Rosa Mts., *Clary* 1965 (hardly separable from P. linearis); Yaqui Well, e. San Diego Co., *Jepson* 17,114a. Cismontane S. Cal.: San Bernardino Valley, *Parish*.

Refs.—PECTOCARYA HETEROCARPA Jtn., Jour. Arn. Arb. 20:399 (1939). *P. penicillata* var. *heterocarpa* Jtn., Contrib. Gray Herb. 70:37 (1924), type loc. Corn Sprs., Chuckwalla Valley, *Munz & Keck* 4870; Jepson, Man. 841 (1925).

4. **P. linearis** DC. Stems several to many from the base, diffuse or sometimes erect, 2 to 8 inches long; herbage strigose; leaf-blades linear, 3 to 11 lines long; nutlets divergent in pairs, oblong, surrounded by a wing shallowly cleft (about half-way) on each side into 4 to 6 (or 8) short-lanceolate or triangular lobes or teeth, the teeth conspicuous, tipped with a short stoutish uncinate bristle.

Sandy flats and slopes, 900 to 2500 feet: eastern Mohave Desert; Colorado Desert. East to Arizona, south to Mexico; Chile. Mar.-May.

Geog. note.—The original form of the species is Chilean, but plants from our Sonoran region correspond closely with plants from Chile. On the whole, this typical form seems rare in the California deserts and there are here cited only the following. Eastern Mohave Desert: Hinkley (n. of), *Clokey* 6854; Calico Wash, n. of Daggett, *Jepson* 6705; Amboy Crater, *Jepson* 20,310; Essex, *Jepson* 18,162a. Colorado Desert: Cottonwood Sprs., Eagle Mts., *Clokey* 6860; Yaqui Well, e. San Diego Co., *Jepson* 17,114.

Var. **ferocula** Jtn. Wing narrower, usually more deeply dentate or laciniate, the triangular or subulate teeth more numerous, regular or often irregular, uncinate-tipped; wing sometimes reduced, semi-obsolete or obsolete and its edge merely bristly.—Flats in cañons and valleys or on gravelly or grassy hillslopes, 50 to 2500 feet: South Coast Ranges (mostly in the inner range, always back of the coast line); Sierra Nevada foothills in Kern Co.; central and western Mohave Desert; Santa Barbara Islands; cismontane Southern California. South to Lower California; also in South America.

Locs.—South Coast Ranges: Corral Hollow, w. San Joaquin Co., *Hoover* 3043; Puerto Cañon, w. Stanislaus Co., *Hoover* 4344; Kettleman Hills, w. Fresno Co., *Hoover* 3318; Coalinga, *Jepson* 17,014; Kings City (6 mi. w.), *Keck & Clausen* 3046. Sierra Nevada foothills: betw. Oildale and Woody, Greenhorn Mts., *Hoover* 3169. Central and western Mohave Desert: Calico Wash, n. of Daggett, *Jepson* 6705; Neenach School, Antelope Valley, *Jepson* 19,236a. Santa Barbara Isls.: Prisoners Harbor, Santa Cruz Isl., *Jepson* 12,066; Santa Catalina Isl., *Fosberg* 10,644; San Clemente Isl., *Munz* 6690. Cismontane S. Cal.: Simi Valley, Ventura Co., *Jepson* 8455; Arroyo Seco, San Gabriel Mts., *Peirson* 324; Hemet, Riverside Co., *C. F. Baker* 4139; Trabuco Cañon, Santa Ana Mts., *Wolf* 1846; Cuyamaca Mts., *Newlon* 357; La Junta near Jamul, San Diego Co., *Newlon* 345.

Refs.—PECTOCARYA LINEARIS DC., Prodr. 10:120 (1846); Jepson, Man. 841 (1925), in small part. *Cynoglossum lineare* R. & P., Fl. Peruv. 2:6 (1799), type from Chile. *Myosotis gracilis* R. & P., l.c., type from Chile. *P. gracilis* Jtn., Contrib. Gray Herb. 70:36 (1924). *P. gracilis* var. *platycarpa* M. & J., Contrib. Gray Herb. 70:36 (1924), type loc. mesas near Camp Lowell, Ariz., *Pringle*. *P. platycarpa* M. & J., l.c. 81:81 (1928). Var. FEROCULA Jtn., Contrib. Arn. Arb. 3:95 (1932), type loc. Santa Cruz Isl., *Munz & Crow* 11,846. *P. linearis* Jepson, Man. 841 (1925), in greater part.

5. **P. recurvata** Jtn. Stems several to many from the base, diffuse, 3 to 10 inches high; herbage strigose or ascending-hispid; leaf-blades linear, 2 to 5 lines long; nutlets divergent in pairs, strongly recurved (sometimes curved almost into a circle), the body linear, the wing divided to or almost to the body into rather regular subulate segments, the segments tipped with short uncinate bristles; upper end of the nutlets elongated and narrowed into a spatulate apex tipped with a tuft of uncinate bristles.

Sandy flats, 50 to 4000 feet: Inyo Co.; Mohave and Colorado deserts. East to Nevada and Arizona, south to Sonora and Lower California. Mar.-Apr.

Locs.—Inyo Co.: Johnson Cañon, Panamint Range, *Jepson* 19,682. Mohave Desert: Paradise Spr. (5 mi. ne.), Paradise Mts., *Jepson* 17,247; betw. Bristol Mts. and Old Dad Mts., *Jepson* 20,381. Colorado Desert: Palm Sprs. (of Mt. San Jacinto), *Parish* 20,001; Wagon Wash, near Sentenac Cañon, e. San Diego Co., *Jepson* 12,491; Vallecito, e. San Diego Co., *Jepson* 8564.

Ref.—PECTOCARYA RECURVATA Jtn., Contrib. Arn. Arb. 3:97 (1932), type loc. Chandler, Ariz., *Harrison & Kearney* 6507.

6. **P. setosa** Gray. Stem stoutish, erectly or diffusely branched from or near the base, 5 to 9 inches high; herbage hispid as well as minutely strigose-pubescent; calyx-lobes armed with 3 to 6 stout straight divergent bristles; nutlets in divergent pairs, 2 wingless, 2 bordered by a broad thin-scarious wing, the body of the nutlet and commonly also the wing beset with slender uncinate-tipped bristles, the body rarely naked or nearly naked, the wing entire or obscurely undulate.

Dry sand of valley floors, hillslopes or desert mesas, 1500 to 5500 (or 7400) feet: east side of the Sierra Nevada from Lassen Co. to Inyo Co.; inner and middle South Coast Ranges from western San Joaquin Co. to San Luis Obispo Co.; Mohave and Colorado deserts; intramontane Southern California (a few scattered stations in ranges bordering the deserts). South to Lower California, east to Arizona, thence north to Washington. Apr.-June.

Locs.—Sierra Nevada (transmontane region): Honey Lake, Lassen Co., *T. Brandegee;* Hanaupah Cañon, Panamint Range, *Jepson* 7050. Inner and middle South Coast Ranges: Corral Hollow, w. San Joaquin Co., *Hoover* 3042; Kettleman Hills, w. Fresno Co., *Hoover* 3317; Pozo (7 mi. e.), San Luis Obispo Co., *Ferris* 9097. Mohave Desert: Neenach School, Antelope Valley, *Jepson* 19,239; Mohave (12 mi. e.), *Carter* 1257; Cajon Pass, *Jepson* 6130; Victorville, *Jepson* 20,287; Calico Mts., *Jepson* 17,227; Granite Mts. (s. of Avawatz Mts.), *Jepson* 17,296; Willow Sprs. (cove below), Old Dad Mts., *Jepson* 20,450; Hole-in-the-Wall, Providence Mts., *Jepson* 18,319; New York Mts., *Jepson* 5457. Colorado Desert: Indian Cañon, Collins Valley, ne. San Diego Co., *Jepson* 8850; Wagon Wash near Sentenac Cañon, e. San Diego Co., *Jepson* 12,490; Coyote Wells, sw. Imperial Co., *Orcutt* 237. Intramontane S. Cal. (in ranges bordering the deserts): Lytle Creek Cañon, e. San Gabriel Mts., *Hall* 1475; Thomas Valley, San Jacinto Mts., *Jepson* 1465; Vandeventer Flat, Santa Rosa Mts., *Jepson* 1420; Nigger Jim Hill, Cahuilla, *Hall* 1183.

Refs.—PECTOCARYA SETOSA Gray, Proc. Am. Acad. 12:81 (1876), type loc. upper Mohave River, *Palmer;* Jepson, Man. 841 (1925). *Gruvelia setosa* Rydb., Bull. Torr. Club 40:479 (1913). *P. setosa* var. *aptera* Jtn., Contrib. Gray Herb. 70:38 (1924), type loc. Campo, San Diego Co., *Abrams* 3671; Jepson, Man. 841 (1925); nutlets all wingless. *P. setosa* var. *holoptera* Jtn., l.c. 70:39, type loc. Granite Wells, Mohave Desert, *Johnston* 6489; Jepson, Man. 841 (1925); nutlets all wing-margined.

7. **MERTENSIA** Roth. LUNGWORT

Perennial herbs with erect leafy stems terminated by clusters of showy light blue flowers. Herbage glabrous or nearly so. Leaves broad, the lower mostly petioled. Calyx 5-cleft or -parted, in ours small (1 to 2 lines long). Corolla tubular (in ours) or campanulate. Stamens with flattened or filiform filaments inserted on the crested open throat of the corolla. Style filiform; stigma entire. Nutlets attached to the convex receptacle by a small scar just above the base, roughish or wrinkled at maturity.—Species about 30, North America, Europe and Asia. (F. K. Mertens, a German botanist, 1764–1831.)

Stems from an elongated stout tap-root; lower leaves long-petioled; corolla tube 1 to 2 times as long as the throat and limb.
  Stems mostly 2 to 5 feet high; leaf-blades ovate to lanceolate, mostly acute; Sierra Nevada.... 1. *M. ciliata.*
  Stems mostly ½ to 1 foot high; leaf-blades mostly oblong, mostly obtuse; Sierra Co. to Modoc Co.......................2. *M. oblongifolia.*
Stems from a short tuberous root; lower leaves subsessile or with short broad petioles; corolla-tube 3 to 4 times as long as the throat and limb; Modoc Co.......................3. *M. longiflora.*

1. **M. ciliata** G. Don var. **stomatechoides** (Kell.) Jepson. (Fig. 414.) Stems several from the root-crown, simple or somewhat branched, leafy, 2 to 5 feet high; herbage glabrous or nearly so, glaucous; leaf-blades ovate to lanceolate, entire, 2 to 7 inches long, narrowed to a petiole ¼ to 1½ times as long, or the upper cauline ones sessile; flowers in short loose racemes at the ends of the stem and branchlets, usually drooping; corolla light-blue, with small yellow-tipped crests set in the summit of tube, the cylindrical tube 2½ to 3 lines long, the open-campanulate throat and limb nearly or quite as long; filaments broad, included, inserted on the summit of the corolla-tube alternate with the crests; style exserted.

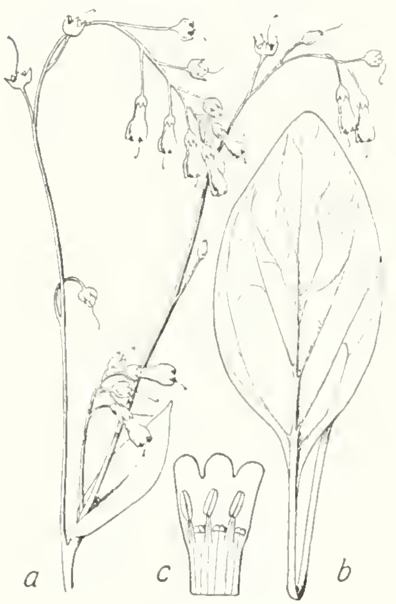

Fig. 414. MERTENSIA CILIATA G. Don var. STOMATECHOIDES Jepson. *a*, fl. branchlet, × ½; *b*, leaf, × ¼; *c*, sect. of corolla, × 1½.

Moist, usually shaded places, montane, 5000 to 10,200 feet: Sierra Nevada from Modoc Co. to Tulare Co. East to western Nevada. Apr.-Sept.

Locs.—As to its distribution in California, Mertensia ciliata var. stomatechoides occurs both on the west slope of the Sierra Nevada and on the east side. On the west slope, it tends to keep, for the most part, to the higher easterly plateaus or valleys or peaks. No wholly trustworthy record has been established as yet for the Coast Ranges. The following stations are for the Sierra Nevada region. Sierra Nevada, west slope: Indian Valley, Plumas Co., *R. M. Austin;* Jonesville, Butte Co., *Copeland* 450; Phillips sta., Eldorado Co., *H. M. Evans;* Big Mdw., Calaveras Co., *Jepson* 10,089; betw. Yosemite Falls and Eagle Peak, Yosemite, *Jepson* 4352; Kaiser Peak, *A. L. Grant* 1440; Huntington Lake, Fresno Co., *A. L. Grant* 1095; near Cahoon Mdw., w. of Mt. Silliman, *Jepson* 728; Farewell Gap, Tulare Co., *Purpus* 5233; Volcano Creek, Tulare Co., *Jepson* 4934; Coyote Creek, Kern River, *Mary Haskell;* Red Rock Mdws., se. Tulare Co., *Zeile.* Sierra Nevada, east side: Lassen Creek, ne. Modoc Co., *R. M. Austin;* Sierra Valley, *Lemmon;* Carson Pass, Alpine Co., *Yates* 3955; White Mts., se. Mono Co., *Shockley* 493.

Refs.—MERTENSIA CILIATA G. Don, Gen. Hist. Dich. Plants 4:372 (1838). *Pulmonaria ciliata* James, Trans. Am. Phil. Soc. ser. 2, 2:176 (1825), nomen nudum; Torr., Ann. Lyc. N. Y. 2:224 (1828), type loc. "along streams, within the Rocky Mts.," *James.* Var. STOMATECHOIDES Jepson, Man. 842 (1925). *M. stomatechoides* Kell., Proc. Cal. Acad. 2:148, fig. 43 (1863), type loc. headwaters of Carson River, Sierra Nevada, *Gibbs. M. sibirica* Gray, Bot. Cal. 1:523 (1876), in part; not G. Don.

2. **M. oblongifolia** G. Don. Stems simple, 6 to 13 inches high, 1 or few from a heavy root-crown, the crown heavily thatched with old scales of winter buds and petiole bases; herbage glabrous, or the leaves puberulent; leaves 1 to 4 inches long, the blades broadly to narrowly oblong and obtuse, or the uppermost broadly lanceolate, the basal narrowed to a distinct petiole ½ to as long, the cauline narrowed to an indistinct petiole or the upper sessile; flowers clustered in a small somewhat drooping terminal panicle; corolla blue, 5 to 6 lines long, the throat and limb ½ as long to as long as the tube.

Moist places on rocky slopes, generally in lava soil, 4500 to 6500 feet: Sierra Nevada (east side) from Sierra Co. to Modoc Co. North to Idaho, east to Utah. May-July.

Locs.—Loyalton (4 mi. ne.), Sierra Co., *Stebbins & Jenkins* 2124; Lassen Peak (near), *Lemmon;* Forestdale, sw. Modoc Co., *M. S. Baker;* Emigrant Sprs., cent. Modoc Co., *R. M. Austin;* Goose Lake Valley, Modoc Co., *Austin & Bruce* 2260; Jess Valley, Warner Mts., *Steffen* 29a; Fort Bidwell, *Manning* 83. Varieties have been distinguished on the basis of leaf pubescence, its partial or general presence or complete absence, but such forms have no geographic significance and are often mixed in single collections.

Refs.—MERTENSIA OBLONGIFOLIA G. Don., Gen. Hist. Dich. Plants 4: 372 (1838). *Pulmonaria oblongifolia* Nutt., Jour. Acad. Phila. 7:43 (1834), type loc. "sources of Columbia River," *Wyeth. Mertensia foliosa* Nels., Bull. Torr. Club 26:243 (1899), type loc. Evanston, Wyo., *Nelson* 2951. *M. amoena* Nels., Bot. Gaz. 30:195 (1900), type loc. Monida, Mont., *Nelson* 5413. *M. bakeri* var. *amoena* Nels., Man. Bot. Rocky Mts., 422 (1909). *M. foliosa* var. *amoena* Jtn., Contrib. Arn. Arb. 3: 85 (1932). *M. oblongifolia* var. *amoena* Williams, Ann. Mo. Bot. Gard. 24:125 (1937). *M. symphytoides* Greene, Pl. Baker. 3:20 (1901), type loc. Emigrant Sprs., Modoc Co., *R. M. Austin. M. nevadensis* Nels., Proc. Biol. Soc. Wash. 17:96 (1904), type loc. Hunter Creek Cañon, near Reno, Nev., *Kennedy & True* 711. *M. foliosa* var. *nevadensis* Mcbr., Contrib. Gray Herb. 48:19 (1916). *M. oblongifolia* var. *nevadensis* Williams, Ann. Mo. Bot. Gard. 24:130 (1937).

MERTENSIA BELLA Piper, Proc. Biol. Soc. Wash. 31:76 (1918), type loc. Horse Pasture Mt., Lane Co., Ore., *Peck* 5811. Stem slender, rather freely branched, 1 to 1½ feet high, arising from a tuberous root; leaves ovate, the uppermost opposite; corolla blue, campanulate, 3 lines long.—Ore.: Grayback Mt., Siskiyou Mts., *Applegate* 8751 (near California line).

3. **M. longiflora** Greene. Stem erect, simple, 4 to 6 inches high, arising from a shallow tuberous root; herbage glabrous or nearly so, the upper side of the leaves scabridulous; leaves 1 to 2½ inches long, the blades oblong-ovate or spatulate-obovate, mostly obtuse, the upper sessile, the lower narrowed to a short broad petiole or subsessile; panicle mostly drooping; corolla bright blue, 7 lines long, the tube long and narrow, the throat very short (1 to 1¼ lines long) but longer than the very short lobes.

Well-drained soil of open hillsides, 5000 to 7000 feet: Modoc Co. North to southern British Columbia and western Montana. Apr.-June.

Geog. note.—The center of distribution of Mertensia longiflora, a very distinct species, is probably in Idaho. Thence it ranges south through eastern Oregon (*Cusick* 1830) into Modoc Co., California (near Fort Bidwell, *Gilman* 583, and South Warner Mts., *L. S. Smith* 1083, outlying localities, representing the southernmost known stations).

Refs.—MERTENSIA LONGIFLORA Greene, Pitt. 3:261 (1898), type loc. Hangman Creek, Spokane Co., Wash., *Sandberg & Leiberg;* Jepson, Man. 842 (1925). *M. oblongifolia* Gray, Syn. Fl. 2:200 (1878), in part; not G. Don (1838).

Echium plantagineum L., Mant. 2:202 (1771), "habitat in Italia." Stems few or several, ascending from a biennial root, 6 to 11 inches high; corolla showy, blue, 9 to 11 lines long, its short tube spreading into a broad campanulate throat and oblique limb with unequal lobes; stamens exserted; nutlets wrinkled.—Native of southern Europe; adventive at De Luz, San Diego Co. (Madroño 4:34).

8. **MYOSOTIS** L. FORGET-ME-NOT

Slender leafy-stemmed herbs with small flowers in loose racemes. Racemes bractless (or sometimes leafy at base), terminating the stem and branchlets. Corolla blue (rarely white or rarely at first yellowish), short-salverform, with prominent crests in the throat. Nutlets small, ovoid, smooth and shining.—Species 35, all continents. (Greek mus, mouse, and otos, ear, mouse-ear, to which the leaves of some species are fancifully likened.)

Calyx-tube densely set with uncinate hairs; introduced species.
  Leaves all sessile, ½ to 1¼ inches long; corolla inconspicuous (½ to 1 line broad)............... 1. *M. versicolor.*
  Basal leaves petioled, mostly 2 to 4 inches long; corolla rather showy (2½ to 3 lines broad). 2. *M. sylvatica.*
Calyx thinly strigulose with straight hairs; native species, Del Norte Co........................3. *M. laxa.*

1. **M. versicolor** Sm. English Scorpion-grass. Annual; stem erect, 7 to 15 inches high; herbage pilose; leaf-blades oblong to linear, sessile, ½ to 1¼ inches long, the basal in a rosette; calyx-tube with uncinate hairs, the lanceolate lobes puberulent, about as long as the tube; pedicels shorter than fruiting calyx; corolla at first yellowish, then blue, minute, ½ to 1 line broad; fruiting pedicels shorter than the calyces.

Marshes or moist meadows, 5 to 3500 feet, sparingly naturalized from Europe: Humboldt, Trinity and Sonoma Cos.; Plumas Co. May-July.

Locs.—Willow Creek, n. Humboldt Co., *Tracy* 15,298; Lawrence Creek, n. Humboldt Co., *Tracy* 14,809; Eureka, *Tracy* 827, in 1900; Fields Landing, Humboldt Bay, *Jepson* 17,917; Hydesville, cent. Humboldt Co., *Tracy* 6963; Cape Ridge, near Cape Mendocino, *Tracy* 14,891; Dyerville, South Fork Eel River, *Constance* 803; Fort Seward, e. Humboldt Co., *Tracy* 13,847; Salyer, Trinity Co., *Tracy* 8020; Pitkin Marsh, Vine Hill region, Sonoma Co., *Robbins* 198; betw. Quincy and Lake Almanor, Plumas Co., *Keck* 1670.

Refs.—Myosotis versicolor Sm., English Bot. 36:2558 (1814). *M. arvensis* var. *versicolor* Pers., Synop. Pl. 1:156 (1805), type European.

2. **M. sylvatica** Hoffm. Wood Forget-me-not. Stems leafy, somewhat branched above, 1 to 1½ feet high, decumbent at base, usually several from a perennial rootstock; herbage hirsute, the stem with spreading hairs; leaf-blades broadly oblong-spatulate to oblong, entire, 1 to 4 inches long, the basal and lower cauline petioled, the upper sessile; pedicels shorter than (rarely equaling) fruiting calyx; calyx-tube with uncinate hairs, its lobes lanceolate, puberulent, equaling or longer than the tube; corolla light blue, 2½ to 3 lines broad.

European garden plant, sparingly naturalized in moist shaded valleys, 10 to 500 feet: San Francisco Bay region; Humboldt Co. Apr.-June.

Locs.—Mt. Davidson, San Francisco, *Jepson* 10,358; San Anselmo, Marin Co., *Chandler* 290; Mill Valley, Marin Co., *Jepson* 7452; Berkeley, *Chandler;* Dyerville, South Fork Eel River, *Jepson* 16,685.

Refs.—Myosotis sylvatica Hoffm., Deutsch. Fl. 61 (1791), type European; Jepson, Fl. W. Mid. Cal. 441 (1901), Man. 842 (1925).

3. **M. laxa** Lehm. Perennial, the stems very erect, 9 to 12 inches high; herbage strigulose; leaf-blades linear-oblong, ¾ to 1 inch long, sessile or the basal shortly petioled; raceme very loose, the pedicels about equaling fruiting calyces; calyx thinly strigulose, its lobes equaling or slightly shorter than the tube; corolla blue, 1½ to 2 lines broad.

Wet ground, 10 to 500 feet: Del Norte Co. North to British Columbia, thence east to New York and Newfoundland. July.

Loc.—Lake Talawa, *Tracy* 16,365 (first definite record for California).

Refs.—Myosotis laxa Lehm., Asperif. 83 (1818), "habitat in America septentrionali"; Britton, Ill. Fl. 3:85 (1913).

Myosotis scorpioides L., Sp. Pl. 131 (1753), type European. *M. palustris* Lam., Fl. Fr. 2:283 (1778), type European; Jepson, Man. 842 (1925). True Forget-me-not. Stem erect from a perennial rootstock, 11 to 15 inches high; herbage thinly strigulose; leaves oblong, mostly sessile; calyx strigulose, the hairs not uncinate, its lobes triangular, shorter than the calyx-tube; corolla blue with a yellow eye, (1½ or) 2½ to 4 lines broad; fruiting pedicels equaling or longer than the calyces.—Native of Europe, an escape from gardens: Quincy, Plumas Co., *Heller* 10,861, in 1913; Emerald Bay, Lake Tahoe, *Ottley* 1190, in 1920. June-July.

Myosotis virginica B. S. P., Prelim. Cat. Anthophyta and Pteridophyta New York City, 37 (1888). *Lycopsis virginica* L., Sp. Pl. 139 (1753), type from Va. Spring Scorpion Grass. Annual or biennial; stem erect, 5 to 10 inches high; herbage spreading-hirsute; leaf-blades oblanceolate, ½ to 1½ inches long, sessile or the lower drawn down to a broad petiole; calyx densely hispid, cleft nearly half-way into unequal lobes; calyx-tube hispid-uncinate; corolla white, ½ line broad; fruiting calyx spreading or nodding.—Native of se. United States, in California adventive in valley grain fields, 500 to 600 feet: Trinity Co. (Salyer, *Tracy* 8025); Humboldt Co. (Willow Creek, *Tracy* 15,297).

Symphytum L. Coarse perennial herbs with entire leaves. Flowers in a cymose cluster, the two forks of the cyme consisting of scorpioid racemes which are at length elongated. Corolla in ours purple, tubular, shallowly 5-lobed, its throat with 5 prominent lanceolate crests alternating with and as long as the stamens. Stamens included; style exserted. Nutlets 4, merely wrinkled, inserted at base by a hollowed scar, its edge toothed. S. ASPERUM Lepechin, Nov. Act. Acad. Petrop. 14:442, t. 7 (1805), type from the Caucasus. Rough Comfrey. Stems 2 to 3 feet high; herbage scabrous-hairy; leaf-blades ovate- to oblong-lanceolate, acuminate, 4 to 7 inches long, very shortly petioled or subsessile; flowers 7 lines long.—Native of Asia, an occasional garden escape around Humboldt Bay: Salmon Creek, *Tracy* 4679 in 1916; Arcata, *Kate Stirring* in 1923.

Lycopsis L. Coarse setose-hispid annuals with small flowers and bracteate racemes. Corolla with unequal lobes, the tube curved at the middle, the throat closed with hispid scales. Nutlets ovoid; scar large, oval, excavated, bordered by a thickened cartilaginous ring. L. ARVENSIS L., Sp. Pl. 139 (1753), type European; Jepson, Man. 857 (1925). Small Bugloss. Stems 1 to 2 feet high; herbage with spreading bristly hairs pustulate at base; leaf-blades narrowly oblong, undulate-margined, the lower petioled, the upper sessile; racemes usually branched; corolla blue or at first purple, the tube not longer than the calyx, the lobes barely 1 line long; nutlets finely and brokenly reticulate-rugose.—Native of Eur.; adventive at Upland, San Bernardino Valley, *Johnston* 29 in 1917.

9. LITHOSPERMUM L. PUCCOON

Ours pubescent or hairy perennial herbs, usually with red or violet-colored roots containing coloring matter. Stems few or several from the root-crown, in ours branched only at the summit (or above the middle). Flowers in the axils of the crowded upper leaves or in leafy spikes. Calyx 5-parted. Corolla in ours yellow, salverform or funnelform, with rounded lobes imbricated in the bud. Filaments short; anthers short, included. Style slender; stigma truncate-capitate or 2-lobed. Nutlets 4 or by abortion fewer, ovate, in ours ivory-white, bony and shining, erect, attached to the flat receptacle by the base; scar flat, rather small.—Species about 50, all continents except Australia. (Greek lithos, a stone, and sperma, a seed.)

Leaves linear-lanceolate to linear, clothing amply or densely the stems and upper branches; corolla greenish-yellow, the anthers set in upper part of throat; pubescence silky....1. *L. ruderale*.
Upper leaves ovate or oblong-lanceolate, discretely spaced on the stem and its upper branches; corolla golden-yellow, the anthers set in the lower part of throat; pubescence harsh.......... 2. *L. californicum*.

1. **L. ruderale** Dougl. COLUMBIA PUCCOON. Stems densely leafy, several from the branched root-crown, ½ to 1¼ feet high; herbage silky-pubescent, the stems sometimes spreading-hirsute; leaf-blades linear-lanceolate to linear, 1 to 3½ inches long, sessile; flowers crowded on short branchlets in the terminal leafy cluster, the branchlets slightly elongating in fruit to form a close panicle; calyx-lobes linear; corolla campanulate-funnelform, greenish-yellow, 4 to 5 lines long, the tube equaling calyx or a little longer, the open throat naked or nearly so; sinuses of corolla closed; nutlets broadly ovate, acute, 2 to 2½ lines long.

Dry montane slopes, often with Artemisia tridentata, 4500 to 6000 feet: northern Sierra Nevada from Placer Co. to Modoc Co. North to British Columbia and Alberta, east to southern Nevada and to Colorado. May-June.

Locs.—Betw. Truckee and Tahoe, Placer Co., *Sonne* 244; Blue Cañon, Placer Co., *Sonne* 692; Hawks, Plumas Co., *Sawyer* 175; Martin Sprs., Eagle Lake, *Brown & Wieslander* 64; Fort Bidwell, Modoc Co., *Jepson* 7917.

Refs.—LITHOSPERMUM RUDERALE Dougl.; Lehm., Pugill. 2:28 (1830), type loc. Columbia and Willamette (Multnomah) rivers, *Douglas;* Jepson, Man. 843 (1925). *L. pilosum* Nutt., Jour. Acad. Phila. 7:43 (1834), type loc. Flathead River, Mont., *Wyeth*. *L. lanceolatum* Rydb., Mem. N. Y. Bot. Gard. 1:333 (1900), type loc. Lewiston, Ida., *Heller* 3092.

2. **L. californicum** Gray. SHASTA PUCCOON. Stems few or several from the root-crown, erect, 6 to 15 inches high; herbage spreading-hispid; leaves ¾ to 2

inches long, the upper leaf-blades ovate to oblong-lanceolate, the lower lanceolate to linear; stems branched at summit, the branches with discrete leaves and with flowers borne singly on short branchlets in the leaf-axils, thus forming an open panicle; corolla 6 to 7 lines long, the limb 4 lines broad, the tube twice as long as the calyx; sinuses of corolla-lobes open; anthers on very short filaments (subsessile), inserted in lower part of throat, the style ½ as long as the corolla-tube or a little exceeding the anthers; nutlets similar to L. ruderale.

Dry montane slopes, 1400 to 5000 feet: Sierra Nevada from Placer Co. to Shasta Co.; North Coast Ranges from western Tehama Co. to western Shasta Co. and Del Norte Co. North to southern Oregon. June.

Locs.—Sierra Nevada: Cape Horn, Placer Co., *K. Brandegee;* Spanish Creek, Plumas Co., *Hall* 9279; Brush Creek, Butte Co., *Conger;* Afterthought Mine, Shasta Co., *M. S. Baker;* Dunsmuir, Siskiyou Co., *Condit.* Coast Ranges: Government Flat, Yollo Bolly Mts., *Bacigalupi & Kraebel;* French Gulch, sw. Shasta Co., *Blasdale;* Sisson, Siskiyou Co., *Jepson* 21,072; Gasquet, Del Norte Co., *Tracy* 11,211.

Refs.—LITHOSPERMUM CALIFORNICUM Gray, Proc. Am. Acad. 10:51 (1874), type loc. Grass Valley, Nevada Co., *Bigelow. L. ruderale* var. *californicum* Jepson, Man. 843 (1925).

LITHOSPERMUM ARVENSE L., Sp. Pl. 132 (1753), type European; Jepson, Fl. W. Mid. Cal. 441 (1901). Annual; nutlets wrinkled-tuberculate.—Adventive at San Francisco (Man. Reg. S. F. Bay 263).

10. **AMSINCKIA** Lehm.

Annuals with rough-hairy herbage, the hairs commonly with a pustulate-dilated base, which is often conspicuously hardened or granular. Flowers yellow, in elongated scorpioid spikes. Calyx-lobes 5, or 4 or 3 through the more or less complete union of two into one. Corolla yellow or orange, funnelform or salverform, the throat destitute of crests or processes, rarely with palate-like folds. Nutlets crustaceous, triquetrous or ovate-triangular, smooth or rough. Cotyledons deeply 2-parted.—Species about 12, North and South America. (Wm. Amsinck of Hamburg, c. 1830, patron of the Botanic Garden in that city.)

Geog. note.—On the basis of number of species and varieties and forms, degree of variability and abundance of individuals, the center of distribution of the genus Amsinckia is to be found in the inner South Coast Range and its immediately bordering plains or valleys. All of our species occur in this range save two which inhabit near-by areas, namely: Amsinckia spectabilis of the not distant coast line and Amsinckia glomerata which grows on the lower San Joaquin Valley plain east of the inner range. Most varieties of these species, as herein described, occur also in the inner South Coast Range or on the San Joaquin Valley plain.

Over several square yards, here and there, of open hills in the inner South Coast Range, over many acres or even square miles, Amsinckia douglasiana establishes pure colonies in its season, which are often sharply defined against other vegetation. For many leagues along the entire length of the Temblor Range, Amsinckia tessellata is a dominant in the hills, a dominant in the main so exclusive in its areas that the slopes are marked for long distances in mid-April or in May by a belt of red-brown color which arises, not from its flowers, but by reason of the maturing action of the sun on its leafage. Amsinckia intermedia, the most widespread species, is often extremely abundant on valley floors. On the other hand, Amsinckia grandiflora, a narrow endemic of the Mount Diablo hills and their bordering valleys, is at the present time a rarity.

In his Synoptical Flora, Asa Gray spoke of the Amsinckia intermedia group of species as difficult to discriminate. By reason of variability they are, but they are by no means so variable as the recent synonymy here cited would imply. The binomials of the synonymy belong mainly to W. N. Suksdorf. He made one brief journey to California and as a result of that journey published a large number of segregates in Amsinckia. It is of significance that his proposed species in each case rest almost exclusively upon a single collection and that his naming of other material, as in the case of a very long series in the University of California Herbarium, is almost always accompanied by a mark of doubt, an expression of reluctance or by qualifying words,—which circumstance has some interest in connection with the considerable number of his species reduced to synonymy in the following treatment.

Amsinckia is a natural genus in which generic resemblance throughout the series is very much more pronounced than the development of differentiating marks for species. Nevertheless, each species or varietal group may fairly well be characterized by features of the corolla, position of the stamens, or shape or markings of the nutlets. The corolla throughout the genus is extremely constant in form, but its variations in size are reasonably uniform within each named form. The nutlets, from one point of view, are highly variable, but in spite of this variation certain features characterize fairly well the fully mature nutlet of each species; even color of the nutlet has a secondary value. Markedly variable is pubescence, both as to kind and distribution of trichomes, and yet the prevailing type of pubescence gives characters of some slight import. It is pleasant to record that the number of nerves in the corolla-tube, as worked out by W. N. Suksdorf, is useful in the group segregation of species.

- Calyx-lobes 2, 3 or 4, unequal in width; corolla-tube 20-nerved below insertion of stamens.
  - Nutlets smooth and polished.
    - Leaves coarsely and densely pustulate above, sparsely so below, bristly-ciliate; scar of nutlets very obscure, narrowly lineate, nearly basal; South Coast Ranges and their east-bordering plain; Mohave Desert; Kern and Inyo Cos...1. *A. vernicosa.*
    - Leaves finely and densely pustulate and hirsute above and below; scar of nutlets conspicuous, ovate-lanceolate, nearly median; Mt. Diablo Range and its bordering valley floors..........2. *A. grandiflora.*
  - Nutlets roughened and dull; scar ovate, median.
    - Corolla 3 to 5 lines broad; calyx bristly and densely rusty-hairy; South Coast Ranges...... 3. *A. douglasiana.*
    - Corolla 1 to 2 lines broad; calyx very bristly and thinly gray-hirsute; South Coast Ranges, San Joaquin Valley and transmontane Cal..........4. *A. tessellata.*
- Calyx-lobes 5, distinct or only slightly united; corolla-tube 10-nerved below insertion of stamens.
  - Leaves entire or obscurely denticulate; calyx-lobes distinct to base; nutlets 1 to 1¼ lines long; interior plants, rarely coastal.
    - Spikes remaining dense below the dense apex, the lower fruiting calyces soon deciduous; corolla salverform, the throat closed, the stamens inserted below middle of tube; lower San Joaquin Valley..........5. *A. glomerata.*
    - Spikes soon loose or with discrete flowers below the dense apex; fruiting calyces mostly persistent; corolla usually funnelform, the throat open and the stamens inserted above middle of tube; widely distributed, mainly cismontane.
      - Corolla 4 to 9 lines long, the tube exceeding the calyx and the limb expanded; herbage yellowish-green, the hairs of the inflorescence usually rusty.......... 6. *A. intermedia.*
      - Corolla 2 to 3 lines long, the tube not exceeding the calyx, the limb barely expanded; herbage pale grayish, rarely with rusty hairs..........7. *A. helleri.*
  - Leaves commonly erose-sinuate; calyx-lobes partly united or sometimes distinct; nutlets ½ to ¾ line long; coast line..........8. *A. spectabilis.*

1. **A. vernicosa** H. & A. Stem stout, branching above, 7 to 18 inches high; herbage glaucous, the stems glabrous or subglabrous, the leaves bristly-ciliate, glabrous above and below, rarely with a few scattered bristles above or below; leaf-blades ovate-lanceolate to oblong- or linear-lanceolate, 1 to 2¾ inches long, sessile, or the lowest tapering to a broad petiole, the abundant pustulate disks frequently producing a tessellate effect; spikes 1 to 5 inches long; calyx-segments strongly hirsute, often partly or wholly confluent so as to appear 2, 3 or 4, in fruit 5 to 9 lines long; corolla golden-yellow, 5 to 6 lines long, the limb (1½ or) 2 to 3½ lines broad; nutlets plane on the back (without median keel) and plane on the lateral faces or nearly so, perfectly smooth and polished, gray, 2 to 3 lines long, the lateral angles carinate with sharp edges, the scar very narrow or hair-like.

Washes, hillslopes and mesas, in open country, 200 to 4500 feet: inner South Coast Range from Alameda Co. to San Luis Obispo Co. and Kern Co. (rarely west to the Santa Lucia Mts. in Monterey Co.); west border of the San Joaquin Valley plain; San Rafael Mts., Santa Barbara Co.; central Mohave Desert; Sierra Nevada in Kern Co.; Inyo Co. Mar.-May.

Locs.—South Coast Ranges: Corral Hollow, Alameda Co., *Hoover* 1751; Puerto Cañon, w. Stanislaus Co., *Hoover* 4341; Gypsum Hills near Ortigalita Creek, w. Merced Co., *Hoover* 2879; Little Panoche Creek, w. Fresno Co., *Hoover* 408; lower Paloma Cañon, near Arroyo Seco, Santa Lucia Mts., *Hoover* 2972; Polonio Pass, San Luis Obispo Co., *Keck & Clausen* 3107. West border of the San Joaquin Valley plain: Arroyo Hondo Wash, w. Fresno Co., *Jepson* 16,951; Sunset, w. Kern Co., *Heller* 7722. San Rafael Mts.: Loma Paloma, *Hall* 7804. Mohave Desert: Calico Mine, Calico Mts., *Lemmon.* Sierra Nevada in Kern Co.: Long Tom Mines, Greenhorn Mts., *C. N. Smith* 245. Inyo Co.: Shepherd Cañon, Argus Mts., *Hall & Chandler* 7068.

Var. **furcata** Hoover comb. n. Herbage glaucous, subglabrous or thin-hispid, the leaves bristly-ciliate; corolla brilliant orange, 7 to 9 lines long, the limb 4 to 7 lines broad.—Inner South Coast Range foothills and valleys (mainly on the east side) and the immediately bordering San Joaquin plain, from western Fresno Co. (Little Panoche Creek, *Hoover* 421; Silver Creek, e. end

Panoche Valley, *Jepson* 18,128; Arroyo Hondo Wash, n. of Cantua Creek, *Jepson* 16,950; Kettleman Plain, *Hoover* 1859) to southeastern San Luis Obispo Co. (White Hills).

The flowers are the largest known in Amsinckia and in a season of high rainfall change the aspect of many leagues of barren hills of the inner South Coast Range with such wide displays of color as to take on somewhat the character of the marvelous. In many areas it is, in its season, the only plant on the naked hills. In some localities it is closely associated with the species.

[1]Refs.—AMSINCKIA VERNICOSA H. & A., Bot. Beech. 370 (1840), type from Cal., *Douglas;* Jepson, Man. 843 (1925). *A. carnosa* Jones, Contrib. W. Bot. 8:35 (1898), type loc. Shepherd Cañon, Argus Range, Inyo Co., *Jones. A. glauca* Suksd., Werdenda 113 (1931), type loc. Sunset, Kern Co., *Heller* 7722. Var. FURCATA Hoover, Endemism in the flora of the Great Valley of California, 107,—1937 (ms.). *A. furcata* Suksd., Werdenda 113 (1931), type loc. White Hills, near Cuyama Valley, se. San Luis Obispo Co., *Eastwood.*

2. **A. grandiflora** Kleeb. Stem erect, branched at the middle or above, 1 to 2 feet high, thinly rough-hispid, the leaves more densely hispid with pustulate bases and also minutely puberulent; leaf-blades linear to oblong, 1 to 3½ inches long, the upper ones lanceolate or narrow-ovate, all sessile or the lower narrowed to a broad petiole; spikes showy, rather dense, at length 2 to 7 inches long; corolla orange-yellow, 7 to 9 lines long, its limb 3 to 5 lines broad; nutlets similar to those of A. vernicosa but the scar ovate-lanceolate, supra-basal (seated above the base ⅓ the way to the apex).

Open grassy flats or hillslopes, 10 to 1200 feet: inner Coast Range in Contra Costa, Alameda and San Joaquin Cos. and its immediately bordering plain. Apr.-May.

Locs.—Judsonville, Contra Costa Co., *T. Brandegee;* e. Livermore Valley, *Greene;* Corral Hollow, w. San Joaquin Co., *Hoover* 3357.

Field note.—On April 9, 1938, Amsinckia grandiflora was discovered on a hillside about one mile north of Corral Hollow, very near the boundary between San Joaquin and Alameda counties. The plants, abounding in a somewhat alkaline clay soil and forming essentially one large colony, made a bright orange spot on the hill visible for several miles. No other existent locality is known. At the original locality, in the vicinity of Antioch, it is perhaps exterminated.—R. F. Hoover.

Refs.—AMSINCKIA GRANDIFLORA Kleeb.; Gray, Bot. Cal. 1:525 (1876), type loc. Antioch, *Kellogg;* Jepson, Fl. W. Mid. Cal. 449 (1901), ed. 2, 350 (1911). *A. vernicosa* var. *grandiflora* Gray l.c. *A. spectabilis* Mcbr., Contrib. Gray Herb. 49:5 (1917); Jepson, Man. 843 (1925); not F. & M. (1836).

3. **A. douglasiana** A.DC. Stem erect, usually rather slender, branching at or above the base or unbranched, 8 to 16 inches high, sparsely bristly-hispid; leaf-blades linear to linear-spatulate or oblong, or the upper lanceolate or narrow-ovate, thinly hispid, 1 to 3½ inches long, sessile or the lower narrowed to a short petiole; spikes 1 to 4 inches long; calyx covered with a dense soft coat of appressed rusty hairs, the bristles relatively few, 1 or 2 pairs of the lobes united, making 3 or 4 of unequal width, the broader ones usually notched at apex; corolla orange-yellow, 6 to 8 lines long, 3 to 5 lines broad; nutlets broadly ovate, broader than thick, 2 lines long, the back flattish, densely tessellate and more or less transversely rugulose, 2 lines long; margins of the nutlets often thin and sometimes corneous-dentate; tessellations and rugae smooth, not scabrous or muricate; dorsal median keel low, sometimes obsolete towards the base.

Dry open hillslopes and valley floors, 400 to 2000 feet: South Coast Ranges back of the coast in Monterey, San Benito and San Luis Obispo Cos., east to the Temblor Range in western Kern Co. and south to northern Santa Barbara Co. Mar.-May.

Field note.—Scattered here and there at intervals, stations for Amsinckia douglasiana are frequent in the Salinas Valley and its neighboring cañons. As one travels southeasterly, it becomes more common. On the west side of the Cholame Valley in eastern San Luis Obispo Co., the vernal landscape is largely dominated by its yellow flowers, and in Palo Prieto Cañon also it colors widely the hills. About Grant Lake in Palo Prieto Pass one may find a large colony, while southward still, from the Yeguas Hills (which lie about north of Yeguas Peak) to the Carrizo Plain, colonies of five hundred acres cover, here and there, the barren hills in April. The Yeguas district appears to be the center of distribution of this species.

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[1] The synonymy in Amsinckia is largely by Robert Francis Hoover.

Locs.—Argus sta., Salinas Valley, *Jepson* 8437; lower Paloma Cañon, near Arroyo Seco, Santa Lucia Mts., *Hoover* 2970; Jolon, Monterey Co., *Plaskett;* Paicines, San Benito Co., *Hoover* 2997; Bitterwater Valley, s. San Benito Co., *Jepson* 16,142; McKay, nw. San Luis Obispo Co., *Graham* 353; Cholame Valley, e. San Luis Obispo Co., *Wiggins* 5794; Palo Prieto Cañon, e. San Luis Obispo Co., *Jepson* 16,192; Bitterwater Creek, Temblor Range, *Ferris* 9075; Wasioja, Cuyama Valley, n. Santa Barbara Co., *Peterson* 179.

Var. elegans (Suksd.) Jepson & Hoover comb. n. Corolla smaller (5 to 6 lines long).—Inner South Coast Range (Kirker Pass, Contra Costa Co., *Hoover* 317; Carrizo Plain, se. San Luis Obispo Co., *Condit*) and west to central Monterey Co.

Refs.—AMSINCKIA DOUGLASIANA A.DC., Prodr. 10:118 (1846), type from Cal., *Douglas. A. lemmonii* Mcbr., Contrib. Gray Herb. 48:50 (1916), type loc. Lemmon's ranch, Cholame, ne. San Luis Obispo Co., *Lemmon* 4593, has large corollas but approaches A. tessellata in vegetative character. *A. tessellata* var. *lemmonii* Jepson, Man. 844 (1925). *A. macrantha* Suksd., Werdenda 102 (1931), type loc. "Jolon road" (that is, betw. King City and Jolon), Monterey Co., *K. Brandegee. A. gloriosa* Eastw.; Suksd., l.c. 103, type loc. Cuyama White Hills, se. San Luis Obispo Co., *Eastwood. A. munzii* Suksd., l.c., type loc. 32 mi. e. of Paso Robles, *Munz* 10,148. Var. ELEGANS Jepson & Hoover. *A. elegans* Suksd., Werdenda 103 (1931), type from Cal., *Fremont. A. pulchra* Suksd., l.c., type loc. Los Banos, *Eastwood* 14,105. *A. cuneata* Suksd., l.c. 104, type loc. Antioch, *Davy* 931; by error as "curvata"; cf. 116 (Berichtigungen 2,—1932). *A. ampla* Suksd., l.c., type loc. Jolon, *Eastwood* 4143.

4. **A. tessellata** Gray. DEVIL'S LETTUCE. Stem stout, coarsely hispid, 1 to 2 feet high; leaves mostly spreading-hispid; leaf-blades linear to lanceolate or oblong (or ovate), 1 to 2½ (or 4) inches long, sessile or the lower narrowed to a petiole-like base; spikes at length ½ to 6 inches long, moderately dense or sometimes loose; calyx very bristly and gray short-hirsute, the hairs usually sparse; calyx-lobes 3 (or 4), usually 2 narrow and 1 broad; corolla 4 to 6 lines long, 1 to 1¾ lines wide; nutlets 1¼ to 1½ lines long, the back flattish or low and rounded, densely tessellate or papillate, usually with median keel and usually more or less transversely rugose.

Dry floors of interior valleys, sandhills, sandy desert mesas or rocky slopes, 200 to 5700 (or 7300) feet: inner South Coast Range (abundant) and west to the Salinas Valley; San Joaquin Valley (infrequent); north and east sides of the Sierra Nevada from Siskiyou and Modoc Cos. to Inyo Co.; Mohave and Colorado deserts. East to Arizona, north to Washington. Mar.-May.

Field note.—Over the main area of the Mohave Desert, Amsinckia tessellata, uniform in aspect and markedly constant in its main characters, is, save exceptionally, the only species of Amsinckia. Desert miners call it Devil's Lettuce by virtue of the bristles on the leaves, but horses, hungry for green forage in arid lands and thus indifferent to the bristles, always seek it in preference to Red-stem Filaree (Erodium cicutarium). The miner's burro also gives it eager attention and refuses to pass it by. The plant is, therefore, valued for forage in the wide wastes of the Mohave.

Although no two collections are alike in nutlets, the nutlet is, nevertheless, constant in its main features. The dorsal area varies greatly as to the relative proportion of tessellations and rugae; sometimes the rugae are few or none. The rugae also vary greatly in position and in length, the tessellations vary greatly in position and shape or size. Notwithstanding all this, the nutlet as a whole, with the somewhat upturned marginal angles of the dorsal area, keeps closely to one recognizable structure.

Locs.—South Coast Ranges: Markley Cañon, e. Contra Costa Co., *Hoover* 2894; Puerto Cañon, w. Stanislaus Co., *Hoover* 2852; Willow Creek School, San Benito Co., *Jepson* 16,130; San Ardo, Monterey Co., *Jepson* 19,083; Paso Robles, *K. Brandegee;* Zapato Chino Creek, Diablo Range, *Jepson* 15,359; upper Cuyama Valley, se. San Luis Obispo Co., *Benson* 3563. San Joaquin Valley: Antioch, *K. Brandegee;* Modesto, *K. Brandegee;* plain near Gould Hill, Temblor Range, w. Kern Co., *Jepson* 17,021; Bakersfield, *Davy* 1720. Tehachapi Mts.: Tehachapi Valley, *Jepson* 18,391. Southern Sierra Nevada in Kern Co.: Cottonwood Creek, Greenhorn Mts., *Benson* 3077. Transmontane Sierra Nevada: Yreka, *Butler* 529; Fort Bidwell, ne. Modoc Co., *Manning* 181; Amedee, Honey Lake Valley, *Davy;* Sugarloaf Peak, n. side of Sierra Valley, *Sawyer* 102; Black Cañon, White Mts., *Duran* 568; Westgard Pass, *J. Grinnell* 1039a; Darwin Wash, Inyo Co., *Benner* 25; Hanaupah Cañon, Panamint Range, *Jepson* 7043. Mohave Desert: Bonanza King Mine, Providence Mts., *Jepson* 18,293; betw. Bristol Mts. and Old Dad Mts., *Jepson* 20,379; Red Rock Cañon, west end El Paso Mts., *J. T. Howell* 4977; Calico Mts., *Jepson* 17,228; Barstow, *Jepson* 5834; Kramer, *Jepson* 5336; Victorville, *Jepson* 20,291; Lancaster, *Jepson* 17,045; Rock Creek, n. slope San Gabriel Mts., *Parish* 1950. Intramontane S. Cal. (infrequent): Lockwood Valley, near Mt. Piños, *Dudley & Lamb* 4689; Leonis Valley, n. Los Angeles Co., *Davy* 2601; San Fernando, *Greene.* Colorado Desert: Cottonwood Spr., Eagle Mts., *Jepson* 12,619; Coyote Cañon, sw. Santa Rosa Mts., *Hall* 2840; San Felipe, e. San Diego Co., *K. Brandegee.*

Refs.—AMSINCKIA TESSELLATA Gray, Proc. Am. Acad. 10:54 (1875), type loc. near Mt. Diablo, *Brewer* 1119; Jepson, Man. 844 (1925). *A. collina* Greene, Man. Reg. S. F. Bay 263 (1894), type loc. hills e. of Livermore Valley, *Greene;* W. N. Suksdorf (Werdenda 105) cites under this name the locality, Mountain House (now Venado), sw. Colusa Co., *K. Brandegee*, but it must be said: (1) A. tessellata has not as yet been found elsewhere in the North Coast Ranges; (2) the plant labeling habits of the collector were disorderly; (3) the label of the Mountain House specimen is plainly not contemporary with the plants. *A. pustulata* Hel., Muhl. 2:243 (1906), type loc. Laws, Inyo Co., *Heller* 8204. *A. tessellata* var. *macrosepala* Jones, Contrib. W. Bot. 12:58 (1908), type loc. Reno, Nev., *Jones*. *A. macrosepala* Suksd., Werdenda 108 (1931). *A. conica* Suksd., l.c. 104 (1931), type loc. Fort Tejon, Kern Co., *Hall* 6284. *A. turrita* Suksd., l.c., type loc. betw. Alcalde and Coalinga, *Eastwood* 13,539. *A. subintegra* Suksd., l.c. 105, type loc. Water Cañon, Tehachapi Mts., *Abrams & McGregor* 484. *A. platycarpa* Suksd. l.c. 106, type loc. Bakersfield, *Eastwood*. *A. dudleyi* Suksd., l.c. 106, type loc. Tehachapi Mts., *Dudley* 490. *A. rostellata* Suksd., l.c., 107, type loc. Mohave sta., Mohave Desert, *Eastwood* 3205. *A. remotifructus* Suksd., l.c. 107, type loc. Fort Bidwell, Modoc Co., *Manning* 181. *A. ovaticarpa* Suksd., l.c. 108, type loc. Paso Robles, *Eastwood* 13,829. *A. mojavensis* Suksd., l.c. 108, type loc. Bonanza King Mine, Providence Mts., *Munz, Johnston & Harwood* 4046. *A. marginata* Suksd., l.c. 109, type loc. Delano, Kern Co., *Eastwood* 3953. *A. deltoidea* Suksd., l.c. 110, type loc. betw. Jacumba and Mountain Sprs., e. San Diego Co., *Eastwood* 9520. *A. salebrosa* Suksd., l.c. 110, type loc. Perris, Riverside Co., *Hall* 2761. *A. obliqua* Suksd., l.c. 111, type loc. King City, Monterey Co., *Eastwood* 4003. *A. brachyantha* Suksd., l.c., type loc. Bakersfield, *Eastwood*.

5. **A. glomerata** Suksd. Stems bushy-branched, ½ to 2 feet high; herbage white setose-hirsute, the hairs arising from disk-like pustules at base, the spikes and calyces beset with yellowish or white bristles; leaf-blades linear to oblong or the upper ones lanceolate or ovate, ½ to 3 inches long, mostly sessile; spikes many, dense, 1 to 2 inches long, terminal on the stems and main branches, usually with shorter ones borne in the forks or on short lateral branchlets; calyx-lobes conspicuously bristly-hispid; corolla yellow, salverform, 2 to 3 lines long, the throat contracted and the limb abruptly spreading, the folds at the throat hairy; stamens borne below middle of corolla-tube; nutlets flattish on the back but with a low sharp keel, densely rough-tessellate, not markedly incurved, seldom muricate, not rugose, or rugose only toward the narrowed apex.

Dry sandy flats, 20 to 250 feet: lower San Joaquin Valley from San Joaquin Co. and eastern Contra Costa Co. to Madera Co. Apr.-June.

Field note.—Amsinckia glomerata, although characteristic of the driest habitats, continues vegetatively active later in the year than Amsinckia intermedia. Where the two grow together, Amsinckia glomerata exhibits a different appearance by reason largely of its white rather than rusty hairs. In the field, it was further observed that Amsinckia glomerata is distinguishable by its salverform corolla and densely villous-ciliate calyx-lobes, but either feature may be found occasionally in plants which seem referable to Amsinckia intermedia.—R. F. Hoover.

Locs.—Lathrop, San Joaquin Co., *Hoover* 2179; betw. Mossdale School and Atlanta, San Joaquin Co., *Jepson* 100d; Tracy, *T. Brandegee;* Modesto (5 mi. s.), *Hoover* 1221; Merced (10 mi. w.), *Hoover* 1113; Cottonwood Creek, Madera Co., *Hoover* 867.

Refs.—AMSINCKIA GLOMERATA Suksd., Werdenda 52 (1931), type loc. Modesto, *K. Brandegee*. *A. straminea* Suksd., l.c. 54, type loc. Antioch, *Davy* 887. *A. setosissima* Suksd., l.c. 55, type loc. San Joaquin Co., plains betw. Mossdale School and Atlanta, *Jepson* 100d.

6. **A. intermedia** F. & M. RANCHERS FIREWEED. (Fig. 415.) Stem erect, slender and strict, or coarse and frequently widely branched, 1½ to 4 feet high; herbage and spikes spreading bristly-hispid; leaf-blades linear to oblong or lanceolate, thickish, entire, 1 to 9 inches long, sessile or the lowest narrowed to a petiole; spikes leafy-bracteate at base, 2 to 4 or at length 5 to 10 inches long, peduncled; calyx-lobes linear-acuminate, rusty-hispid, ½ as long as the corolla, in fruit twice as long as the nutlets; corolla dark or orange-yellow, 4 to 5 lines long, 1 to 3 lines wide; nutlets incurved, keeled dorsally, scabrous-rugose or sharply rugose and the areolae or intervals minutely papillate or muricate, usually gray, 1¼ to 1½ lines long.

Sandy or clay soil of valley flats or hillslopes, often forming rank thickets, 20 to 5500 feet: common throughout cismontane California, rare in the Mohave Desert but occurring in intramontane Southern California on the west margins of the Colorado Desert. South to Lower California, east to Arizona and north to Idaho. Mar.-June.

Field note.—Of our species of Amsinckia, Amsinckia intermedia is the most widely distributed within the borders of California and the one most numerous in individuals. It is a native species which has adapted itself to the changes brought about by modern agriculture and as a weed it now flourishes abundantly in hay fields and grain fields, especially on rich valley floors. During the summer harvests its stinging herbage produces a burning sensation on the skin of field laborers, whence the widely used folk name, Fireweed. It is also called Zaccato Gorda and Buckthorn Weed. In California, it is, in many sections, valued as a dry fodder, but in eastern Washington, E. C. McCulloch has demonstrated that the nutlets in sufficient quantity are poisonous to ranch livestock (Sci. 91:95). This species would thus be the only member of Boraginaceae known to be toxic to animals.

Locs.—Coast Ranges: Yreka, *Butler* 1269; Hiouchi bridge, Smith River, *Tracy* 10,031; Trinity River, near mouth of Willow Creek, Humboldt Co., *Tracy* 10,097; Three Forks of Mad River, Trinity Co., *Tracy* 10,193; Walker Valley, cent. Mendocino Co., *Jepson* 1825a; Lakeport, *Tracy* 5517; Conn Valley, Napa Range, *Jepson* 6253; Las Trampas Ridge, Contra Costa Co., *Jepson* 21,083; Berkeley Hills, *Earle Mulliken* 65; Mt. Davidson, San Francisco, *Jepson* 10,356; Corral Hollow, w. San Joaquin Co., *Jepson* 9594; Stanford, *H. F. Copeland* 8419; Emmet, e. San Benito Co., *Jepson* 18,110; Bitterwater Valley, San Benito Co., *Jepson* 16,141; Cholame Valley, e. San Luis Obispo Co., *Jepson* 19,258. Great Valley: Red Bluff, *Blankinship;* Corning, w. Tehama Co., *Blankinship;* Orland, Glenn Co., *Heller* 11,355; Yuba City, *Jepson* 21,083; College City, Colusa Co., *Alice King;* Sacramento, *Shockley* 396; Vacaville, *Jepson* 100c; Stockton (5 mi. se.), *Jepson* 18,017; Vernalis, sw. San Joaquin Co., *Hoover* 233; Patterson, w. Stanislaus Co., *Jepson* 11,657; Chowchilla (8 mi. w.), Madera Co., *Hoover* 1688; Arroyo Hondo Wash, 2 mi. n. of Cantua Creek, w. Fresno Co., *Jepson* 16,954; Kerman, Fresno Co., *Hoover* 1770: Tipton, Tulare Co., *Jepson* 11,593; Shafter, Kern Co., *Allison Krames;* McKittrick, Kern Co., *Jepson* 16,235. Sierra Nevada foothills: Eldorado Co. foothills, *Hall* 11,256; Ione, Amador Co., *K. Brandegee;* Avery sta., Calaveras Co., *A. L. Grant;* Owens Creek, Mariposa Co., *Jepson* 12,756; Weldon, Kern Co., *Voegelin* 75. Tehachapi Mts.: Caliente, *Heller* 7618. Santa Barbara Isls.: Hungry Man's Gulch, Santa Cruz Isl., *Fosberg* 7520; Avalon, Santa Catalina Isl., *Fosberg* 10,643; San Clemente Isl., *Nell Murbarger* 11. Cismontane S. Cal.: Elwood, Santa Barbara coast, *Eastwood* 8; Arroyo Seco, San Gabriel Mts., *Peirson* 333; San Bernardino, *Parish;* betw. Del Rey and El Segundo, Los Angeles coast, *Fosberg* 10,621; Anaheim plain, Orange Co., *Alice King;* Corona, *Jepson* 19,123; Temescal Cañon, sw. Riverside Co., *Jepson* 19,127; Mesa Grande, San Diego Co., *E. Ferguson* 90; San Pasqual Valley, San Diego Co., *Jepson* 19,167; San Diego, *Jepson* 6666. Mohave Desert: Paradise Mts. (4½ mi. ne.), *Jepson* 20,335. Intramontane S. Cal. (Colorado Desert slope): Whitewater, Riverside Co., *Parish* 469; Ebbens Creek wash, foot of Santa Rosa Mts., *Clary* 2076; Coyote Cañon, sw. Santa Rosa Mts., *Hall* 2842.

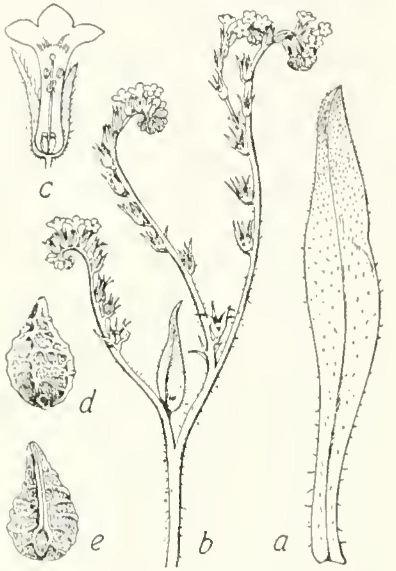

Fig. 415. Amsinckia intermedia F. & M. *a*, leaf, × ⅓; *b*, fl. branchlet, × ½; *c*, long. sect. of fl., × 2; *d*, nutlet, dorsal view, × 5; *e*, nutlet, ventral view, × 5.

Var. **californica** Hoover comb. n. Nutlets tuberculate dorsally (the tubercles smooth and rounded, not scabrous or muricate); corolla usually showy, 5 to 8 lines long; style unusually long, exserted from corolla-tube.—Southeast plain of the San Joaquin Valley floor in Kern Co. and its bordering foothills: Edison, *Hoover* 1823; Bena, *Jepson* 11,616; Caliente, *K. Brandegee.*

Var. **attenuata** (Eastw.) Jepson & Hoover comb. n. Leaves narrow (lanceolate or linear), long-attenuate at apex.—Southern California coast: Santa Catalina Isl., *Trask;* La Jolla, *Clements* 103; San Diego, *Spencer* 170.

Var. **eastwoodae** (Mcbr.) Jepson & Hoover comb. n. Corolla deep orange, 7 to 9 lines long, 2 to 3 times as long as the calyx.—Great Valley and its bordering low hills; cismontane Southern California.

Locs.—Great Valley and bordering hills: Anderson, Shasta Co., acc. *R. F. Hoover;* Chico, *Hoover* 3247; Oroville, *Heller* 10,683; Vernalis, sw. San Joaquin Co., *Hoover* 232; Puerto Cañon, w. Stanislaus Co., *Hoover* 2851; La Grange, Stanislaus Co., *Hoover* 1707; Madera, *Buckminster;* Little Dry Creek near Sparkville, Fresno Co., *Jepson* 15,136; Strathmore, Tulare Co., *Hoover* 736; North Tule River, Tulare Co., *Purpus* 1704; Rowen, Tehachapi Mts., *Jepson* 6713. Cismontane S. Cal.: Upland, San Bernardino Valley, *Johnston* 88; Fallbrook, San Diego Co., acc. *Suksdorf.*

Refs.—AMSINCKIA INTERMEDIA F. & M., Ind. Sem. Hort. Petrop. 2:1 (1835), type loc. Bodega Bay, Sonoma Co.; Erythea 2:136 (1894); Jepson, Fl. W. Mid. Cal. 448 (1901), ed. 2, 350 (1911). *A. spectabilis* Greene, Man. Reg. S. F. Bay 262 (1894); Jepson, Fl. W. Mid. Cal. 448 (1901), ed. 2, 350 (1911); not F. & M. *A. campestris* Greene, l.c., type loc. Byron Sprs., e. Contra Costa Co., *Greene*. *A. douglasiana* var. *campestris* Jepson, Man. 844 (1925). *A. obvallata* Greene; Mcbr., Contrib. Gray Herb. 49:11 (1917), type loc. Tracy, *C. F. Baker* 2779 in part. *A. douglasiana* Mcbr., l.c. 49:12; Jepson, Man. 844 (1925); not A. DC. *A. douglasiana* var. *interior* Mcbr., l.c. 49:13, type loc. betw. Earlimart and Delano, Tulare Co., *Eastwood* 3921. *A. interior* Suksd., Werdenda 70 (1931). *A. valens* Mcbr., Contrib. Gray Herb. 49:14 (1917), type loc. Anderson, Shasta Co., *L. E. Smith* 143. *A. intactilis* Mcbr., l.c., type loc. Orland, Glenn Co., *Heller* 11,355. *A. parishii* Brand; Fedde, Repert. Sp. Nov. 20:320 (1924), type loc. San Bernardino, *Parish* 2817. *A. longituba* Brand, l.c. 25:212 (1928), type loc. Caliente, Kern Co., *Heller* 7618. *A. irritans* Brand, l.c. 25:213, type loc. Irishtown, Amador Co., *Hansen* 1045 in part. *A. hansenii* Brand, l.c., type loc. Irishtown, Amador Co., *Hansen* 1045 in part. *A. longifolia* Brand, l.c. 26:168 (1929), type loc. Salinas road near Del Monte, Monterey Co., *Heller* 6681. *A. santae-barbarae* Brand, l.c., type loc. Elwood, Santa Barbara Co., *Eastwood* 8. (?) *A. leptoclada* Suksd., Werdenda 50 (1931), type loc. Osborne ranger sta. ne. of Covelo, Mendocino Co., *Eastwood* 15,249. *A. cinerea* Suksd., l.c. 51, type loc. Merced, *Buckminster*. *A. anomala* Suksd., l.c., type from Cal., *R. F. Dodd*. *A. oxycarpa* Suksd., l.c. 52, type loc. Antioch, *Eastwood* 10,312a. *A. peltigera* Suksd., l.c. 53, type loc. Antioch, *Eastwood* 10,311a. *A. catalinensis* Suksd., l.c., type loc. Santa Catalina Isl., *K. Brandegee*. *A. multispicata* Suksd., l.c. 54, type loc. Modesto, *Evans*. *A. verrucosa* Suksd., l.c., type loc. Scott Valley, w. Siskiyou Co., *Gilbert*. *A. propinqua* Suksd., l.c. 55, type loc. Hornbrook, Siskiyou Co., *Eastwood* 1260. *A. praecox* Suksd., l.c., type loc. Coalinga, sw. Fresno Co., *Eastwood* 13,469. *A. abbreviata* Suksd., l.c. 56, type loc. Tracy, *C. F. Baker* 2779 in part. *A. brunnescens* Suksd., l.c. 57, type loc. Pacheco Pass, *Eastwood* 14,087. *A. hispidula* Suksd., l.c., type loc. Petrified Forest, Sonoma Co., *Eastwood* 4582. *A. incurva* Suksd., l.c., type loc. hills w. of Willows, Glenn Co., *Eastwood* 11,180. *A. perrugosa* Suksd., l.c., type loc. Brighton, San Mateo Co., *K. Brandegee*. *A. cristata* Eastw.; Suksd., l.c. 58, type loc. Ukiah, *Eastwood*. *A. subglabricaulis* Suksd., l.c., type loc. Merced, *Eastwood*. *A. longifolia* Suksd., l.c. 59, type loc. Briones Valley, Contra Costa Co., *Hall*. *A. appressa* Suksd., l.c. 60, type loc. New York Ravine, Eldorado Co., *K. Brandegee*. *A. vulgaris* Suksd., l.c., type loc. Lake Merced, San Francisco, *Tracy* 1818. *A. elongata* Suksd., l.c. 61, type loc. Burr Valley, Buck Mt., Humboldt Co., *Tracy* 3894. *A. quercetorum* Suksd., l.c., type loc. Marysville Buttes, *Heller* 11,800. *A. angustisepala* Suksd., l.c. 64, type loc. Ione, Amador Co., *K. Brandegee*. *A. manningiae* Suksd., l.c., type loc. Hupa, *Manning* 156. *A. palmeri* Suksd., l.c. 65, type loc. San Diego Co., *Palmer*. *A. communis* Suksd., l.c., type loc. Petaluma, *Eastwood* 10,448. *A. scabra* Suksd., l.c., type loc. Mt. Diablo, *Eastwood* 11,731. *A. franciscana* Suksd., l.c., type loc. Bay View Hills, San Francisco, *Eastwood* 352. *A. elmeri* Suksd., l.c. 66, type loc. Stanford, *Elmer* 4494. *A. peltata* Suksd., l.c., type loc. Mendocino Forest, probably near Round Valley, *Eastwood* 15,325. *A. ctenocarpa* Suksd., l.c., type loc. Coachella Valley, *Rixford*. *A. lacunosa* Suksd., l.c., type loc. Del Monte, Monterey Co., *Elmer* 3567. *A. congruens* Suksd., l.c. 67, type loc. Winters, Yolo Co., *Eastwood* 14,240. *A. pullata* Suksd., l.c., type loc. Tennessee Valley, Marin Co., *Suksdorf* 481. *A. pratensis* Suksd., l.c., type loc. Bluff Lake, San Bernardino Mts., *Munz* 10,596. *A. acuticarpa* Suksd., l.c. 68, type loc. Santa Rosa, *Eastwood* 10,344. *A. parishii* Suksd., l.c. 70, type loc. San Bernardino Valley, *Parish* 6043. *A. divergens* Suksd., l.c., type loc. Andreas Cañon, San Jacinto Mts., *Johnston*. *A. strigosa* Suksd., l.c., type loc. Byron Sprs., e. Contra Costa Co., *Eastwood* 3773. *A. incongruens* Suksd., l.c. 71, type loc. Lompoc, Santa Barbara Co., *Suksdorf* 192. *A. helleri* Suksd., l.c. 72, type loc. Salinas road near Del Monte, *Heller* 6681 (same as type number for A. longifolia Brand); not A. helleri Brand (1928). *A. ramosissima* Suksd., l.c., type loc. "Mendocino Co." (probably in Potter Valley), *Nettie Purpus*. *A. abramsii* Suksd., l.c., type loc. San Pedro Hills, Los Angeles Co., *Abrams* 3140. *A. swainiae* Suksd., l.c., type loc. Santa Cruz Isl., *A. Swain*. *A. conspicua* Suksd., l.c. 73, type loc. San Bernardino, *S. B. & W. F. Parish* 319. *A. rugosissima* Suksd., l.c., type loc. Eldorado Co., *Hall* 11,256. *A. pleurocarpa* Suksd., l.c., type loc. Nipoma Mesa, San Luis Obispo Co., *Eastwood* 14,339. *A. hallii* Suksd., l.c., type loc. Rialto, San Bernardino Co., *Hall* 2948. *A. densiflora* Suksd., l.c. 74, type loc. College City, Colusa Co., *Alice King*. *A. hirsuta* Suksd., l.c., type loc. Pixley, Tulare Co., *T. Brandegee*. *A. paludosa* Suksd., l.c., type loc. Los Angeles ("Bimini Baths"), *Eastwood* 92. *A. viridifolia* Suksd., l.c. 75, type loc. Petaluma, *Eastwood* 10,484. *A. insularis* Suksd., l.c., type loc. San Clemente Isl., *Munz* 6698. *A. canescens* Suksd., l.c., type loc. Raymond, Madera Co., *Eastwood* 12,518. *A. brachycalyx* Suksd., l.c. 76, type loc. Oceano, San Luis Obispo Co., *K. Brandegee*. (?) *A. bullata* Suksd., l.c., type loc. Crescent Mills, Plumas Co., *Eastwood*. *A. multiflora* Suksd., l.c., type loc. King City, Monterey Co., *K. Brandegee*. *A. orthocarpa* Suksd., l.c., type loc. Pozo, San Luis Obispo Co., *Eastwood* 15,129. *A. rupestris* Suksd., l.c. 77, type loc. Mohave sta., Mohave Desert, *Munz* 10,092. *A. linearifolia* Suksd., l.c. 79, type loc. Byron Sprs., e. Contra Costa Co., *Eastwood* 3812. *A. lancifolia* Suksd., l.c. 80, type loc. Diamond Valley, Riverside Co., *Hall* 2891. *A. sparsiseta* Suksd., l.c., type loc. Byron Sprs., Contra Costa Co., *Eastwood* 3796. *A. densifolia* Suksd., l.c., type loc. Tres Piños, San Benito Co., *Eastwood* 7984. *A. humilis* Suksd., l.c. 81, type loc. San Pedro, Los Angeles Co., *Eastwood* 171. *A. delicata* Suksd., l.c., type loc. Banta, San Joaquin Co., *Eastwood* 27,830. *A. vestita* Suksd., l.c., type loc. Calistoga, *East-*

wood 11,260. *A. brandegeae* Suksd., l.c., type loc. Castroville, Monterey Co., *K. Brandegee.* *A. congesta* Suksd., l.c. 82, type loc. Santa Catalina Isl., *K. Brandegee.* *A. keckii* Suksd., l.c., type loc. Mohave Desert, *Munz & Keck* 7912. *A. lanceolata* Suksd., l.c., type loc. Pine Ridge, Fresno Co., *Hall & Chandler* 194. *A. curvata* Suksd., l.c. 83, type loc. "Warrens Campo," San Diego Co., *Eastwood* 9419. *A. amplexicaulis* Suksd., l.c., type loc. Pigeon Pass, Riverside Co., *Hall* 3852. *A. grayi* Suksd., l.c., type loc. Los Angeles, *Gray.* *A. angustata* Suksd., l.c., type loc. Cottonwood Valley, San Diego Co., *Orcutt* 2263. *A. solida* Suksd., l.c. 84, type loc. Stanford, *C. F. Baker* 391. *A. aurea* Suksd., l.c., type loc. Playa del Rey, Los Angeles Co., *Hall* 3768. *A. sparsifolia* Suksd., l.c., type loc. San Luis Obispo Co., *Eastwood* 14,353. *A. pusilla* Suksd., l.c. 85, type loc. Stockton, *Eastwood* 10,591. *A. leucosperma* Suksd., l.c., type loc. Ione, Amador Co., *Eastwood* 10,104. *A. exserta* Eastw.; Suksd., l.c., type loc. Garvanza, Los Angeles Co., *Eastwood* 56. *A. palustris* Suksd., l.c. 86, type loc. Los Angeles ("Bimini Baths"), *Eastwood* 92 (this is the same locality, collector and type number as cited by Suksdorf for the type of *A. paludosa* Suksd.). *A. latiflora* Suksd., l.c., type from Cal., *R. F. Dodd.* *A. spencerae* Suksd., l.c., type loc. Colorado Desert, *Spencer* 251a in part. *A. decumbens* Suksd., l.c., type loc. San Diego, *Spencer* 169. *A. ciliata* Suksd., l.c. 87, type loc. Lathrop, San Joaquin Co., *Suksdorf* 71. *A. laxa* Suksd., l.c., type loc. Lakeside, San Diego Co., *K. Brandegee.* *A. bakeri* Suksd., l.c., type loc. Stanford, *C. F. Baker* 485. *A. condensata* Suksd., l.c. 88, type loc. Suisun, Solano Co., *Eastwood* 347. *A. punctata* Suksd., l.c. 89, type loc. Sepulveda, Los Angeles Co., *Greene.* *A. fluviatilis* Suksd., l.c. 90, type loc. Santa Maria River, *Eastwood* 315. *A. albicarpa* Suksd., l.c., type loc. Colorado Desert, *Spencer* 251a in part. *A. arizonica* Suksd., l.c. 91, type loc. Glendale, Ariz., *Eastwood* 6119. *A. purpusii* Suksd., l.c. 92, type loc. Kernville, Kern Co., *Purpus* 5726. *A. ammophila* Suksd., l.c., type loc. Humboldt Bay, *Tracy* 3152. *A. rivularis* Suksd., l.c., type loc. Santa Maria River (nw. Santa Barbara Co.), *Eastwood* 335. *A. leptostachya* Suksd., l.c., type loc. Comptche, Mendocino Co., *H. A. Walker* 232. *A. modesta* Suksd., l.c. 93, type loc. Modesto, *Chester Dudley.* *A. nitidicaulis* Suksd., l.c., type loc. Alcalde, Fresno Co., *Eastwood* 13,577. *A. scabricarpa* Suksd., l.c., type loc. Banta, San Joaquin Co., *Eastwood.* Var. CALIFORNICA Hoover. *A. californica* Suksd., Werdenda 50 (1931), type loc. Caliente, Kern Co., *K. Brandegee.* *A. longistylis* Suksd., l.c., type loc. Caliente, *K. Brandegee.* *A. speciosa* Suksd., l.c., type loc. "near Kern River gorge on flood plain," *Weston* 506. Var. ATTENUATA Jepson & Hoover. *A. attenuata* Eastw.; Suksd., Werdenda 79 (1931), type loc. Avalon, Santa Catalina Isl., *Carlson.* *A. evermannii* Suksd., l.c. 78, type loc. San Clemente Isl., *Evermann.* *A. diversifolia* Suksd., l.c. 79, type loc. La Jolla, San Diego Co., *F. E. & E. S. Clements.* *A. caduca* Suksd., l.c., type loc. San Diego, *T. Brandegee.* Var. EASTWOODAE Jepson & Hoover. *A. eastwoodae* Mcbr., Contrib. Gray Herb. 49: 14 (1917), type loc. Pollasky (Friant), Fresno Co., *Heller* 8153. *A. douglasiana* var. *eastwoodae* Jtn., Bull. S. Cal. Acad. 17:66 (1918); Jepson, Man. 844 (1925). *A. papillata* Suksd., Werdenda 51 (1931), type loc. Big Sandy Creek, Fresno Co., *Julia McDonald.* *A. jucunda* Suksd., l.c., type loc. Ventura Co., *Eastwood.* *A. verna* Suksd., l.c. 58, type loc. Chico, *Heller* 11,310. *A. disjuncta* Suksd., l.c. 59, type loc. Madera, *Setchell.* *A. yosemitensis* Suksd., l.c. 60, type loc. Yosemite Valley, *Cummings.* *A. johnstonii* Suksd., l.c. 68, type loc. Red Hill, near Upland, San Bernardino Valley, *Johnston* 1872. *A. splendens* Suksd., l.c., type loc. head of San Joaquin Valley, *Davy.* *A. jonesii* Suksd., l.c. 69, type loc. Fallbrook, San Diego Co., *Jones* 3112. *A. stenophylla* Suksd., l.c., type loc. Raymond, Madera Co., *Eastwood* 12,518 (same type number as for *A. conescens* Suksd.).

AMSINCKIA ECHINATA Gray, Proc. Am. Acad. 10:54 (1874), type loc. "Mohave district, se. part of Cal.," *Cooper* (typ. vidi), but, according to the herbarium label, Cooper's specimen was collected at Fort Mohave which is on the Arizona side of the Colorado River (cf. also Macbride, Contrib. Gray Herb. 49:16, and Cooper, Am. Nat. 3:470). *A. menziesii* var. *echinata* Brand; Engler, Pflzr. 4^{252}:211 (1931), as to Fort Mohave citation. The nutlets are remarkable in that the ruga of the carina and the many irregular transverse rugae are thin, irregularly and unequally dentate, in part conspicuously slender-dentate. The surface of the nutlets is also rough-papillate. No material has been seen from California, but collections of Amsinckia intermedia from semi-arid habitats approach A. echinata somewhat.

7. **A. helleri** Brand. HARVEST FIREWEED. Stem erect, strictly branched above, ½ to 2 feet high; herbage spreading-hispid or strigose-hispid, and also more or less puberulent, grayish; leaves 1 to 5¼ inches long, the blades linear (rarely lanceolate), sessile or narrowed to a petiole-like base; calyx white-hispid; corolla pale yellow, 2 to 3 lines long, 1 line broad, its tube not exceeding calyx; nutlets brown, 1 to 1¼ lines long, the dorsal side carinate, finely papillate or slightly or roughly muriculate, or transversely rugose (faintly or strongly) or rugae none; lateral angles weakly or strongly carinate; scar large, ovate.

Open valley floors and hillsides, 100 to 5000 feet: interior of cismontane Southern California; Santa Clara Valley; Great Valley (mostly east side); Sierra Nevada from Fresno Co. to Lassen and Siskiyou Cos. East to Utah (where perhaps introduced) and north to Oregon. Apr.-June.

Tax. note.—The assemblage of Amsinckia helleri, as here described, represents a group of considerable diversity, especially in nutlet characters. This species has been referred to the northern Amsinckia retrorsa Suksd. (Deut. Bot. Monats. 18:134,—1900) by competent botanists, but the Californian plants do not seem to be the same as authentic material of Amsinckia retrorsa from Washington. Size of flowers separates this species from Amsinckia intermedia but is not completely reliable. When growing with that species, however, Amsinckia helleri is different in general aspect.

Locs.—Cismontane S. Cal.: Murietta Hot Sprs., sw. Riverside Co., *Munz* 10,795; Upland, San Bernardino Co., *Munz* 2108; Russell Valley, w. Los Angeles Co., *Jepson* 19,112; Purisima Hills, n. Santa Barbara Co., *Jepson* 11,950. Santa Clara Valley and its bordering foothills: Guadaloupe Mines, *Parks*. Great Valley: Orange Cove, Fresno Co., *Hoover* 1005; Oakdale (8 mi. e.), *Hoover* 2037; Rio Linda, n. Sacramento Co., *Jepson* 16,591; Marysville Buttes, *Heller* 11,364; Chico, *Heller* 11,309; Paskenta, w. Tehama Co., *Virginia Bailey*. Sierra Nevada: Little Dry Creek near Sparkville, Fresno Co., *Jepson* 15,137; Owens Creek, Mariposa Co., *Jepson* 12,756; Jacksonville, Tuolumne Co., Jepson 18,050; Alabaster Cave, bet. Salmon Falls and Auburn, Eldorado Co., *K. Brandegee;* Oroville (hills 6 mi. n.), *Heller* 10,725; Beckwith Pass, Lassen Co., *Jepson* 7777.

Refs.—AMSINCKIA HELLERI Brand; Fedde, Repert. Sp. Nov. 25:212 (1928), type loc. Little Grizzly Creek (near mouth), below Genessee, Plumas Co., *Heller & Kennedy* 8850. *A. parviflora* Hel., Muhl. 2:313 (1907), type loc. Alum Rock Park, Mt. Hamilton Range, *Heller* 8470; Jepson, Man. 843 (1925); not A. parviflora Bernh. (1833). *A. hirticaulis* Suksd., Werdenda 55 (1931), type loc. Modesto, *K. Brandegee* (the type is evidently A. helleri, but other specimens cited by Suksdorf are A. intermedia). *A. copelandii* Suksd., l.c. 62, type loc. Klamathon, Siskiyou Co., *Copeland* 3552. *A. eatonii* Suksd., l.c. 64, type loc. Utah, *Eaton* 251. *A. sparsiflora* Suksd., l.c. 77, type loc. Truckee, *K. Brandegee.*

AMSINCKIA LUNARIS Mcbr., Contrib. Gray Herb. 49:12 (1917), type loc. near San Mateo on Halfmoon Bay road, *Heller* 8555. Stem erect, little branching, 1 to 2½ feet high, thinly spreading-bristly and slightly puberulent; leaves thickish; leaf-blades linear or the upper lanceolate, 1 to 3 inches long, sessile or the lowest drawn down to a petiole-like base, strigose and puberulent or the upper densely puberulent or somewhat velvety; calyx-lobes strigose and with rusty bristles; corolla orange, 4 to 4½ lines long, its tube broad, its limb 2½ to 3½ lines broad; nutlets carinate on back, papillate and sometimes rugose.—Openly wooded or somewhat shaded slopes in the hills, 200 to 1500 feet, San Francisco Bay region: Bald Peak, Berkeley Hills, *Hoover* 975; San Pablo Reservoir, Contra Costa Co., *Hoover* 3178; Lafayette, Contra Costa Co., *Tracy* 13,196. Apr.-May. An uncertain form. This account is by R. F. Hoover.

8. **A. spectabilis** F. & M. Stem simple or branching from or near the base, erect, or the branches at length decumbent, 1 to 2 feet long; herbage light yellowish green, setose-hispid, the hairs scattered or at least thin; leaf-blades linear to ovate-lanceolate or narrowly oblong, with erose-sinuate or entire margins, ½ to 2 inches long, sessile or the basal narrowed to a broad-based petiole; spikes dense (or the calyces at length discrete), 1 to 4½ inches long; calyx with soft appressed rusty hairs (at base of calyx whitish) and spreading-bristly, the lobes linear- or ovate-lanceolate, 2 or 3 of the lobes partly united or all distinct; corolla pale yellow, very slender, 3 to 5½ lines long, the limb 2½ to 3½ lines wide; folds in corolla-throat low, finely hairy or sometimes glabrous; stamens exserted from corolla-tube into throat; nutlets rounded on back, muriculate or rugulose, or sometimes nearly smooth, brown or blackish, ½ to ¾ line long.

Sandy soil along the coast line, 5 to 200 feet: Mendocino Co. to San Diego Co.; Santa Barbara Islands. Mar.-June.

Note on the nutlet.—In both Amsinckia spectabilis and its var. microcarpa the ventral side of the nutlet exhibits a transverse ridge from the scar to the lateral angles; or in some collections this ridge is absent. This absence of the ridge does not seem to be definitely associated with any other character.

Locs.—Fort Bragg, *Mathews* 7; Bodega Head, Sonoma Co., *K. Brandegee;* Land's End, San Francisco, *Davy;* Watsonville, *C. F. Baker* 1952; Monterey, *Mary E. B. Norton;* betw. Guadaloupe and Callender, San Luis Obispo Co., *Ferris* 7611; Surf, nw. Santa Barbara Co., *Ferris* 7547; Santa Rosa Isl., *T. Brandegee;* San Pedro Hills, Los Angeles Co., *Fosberg* 10,618; Point Loma, San Diego, *K. Brandegee.*

Var. **nicolai** Jtn. Racemes leafy-bracteate in lower part.—San Nicolas Isl.; San Clemente Isl. (*Munz* 6771).

Var. **microcarpa** (Greene) Jepson & Hoover comb. n. Calyx-lobes distinct to base or nearly so, its bristles brown or sometimes black; corolla larger (6 to 8 lines long); nutlets densely sharp-muriculate dorsally, rugae none.—Near the coast line from San Luis Obispo Co. (Pismo, *Jepson*

8444) to northwestern Santa Barbara Co. (Orcutt, *Hoover* 3109; Bicknell sta., *Jepson* 12,664; Purisima Hills, *Jepson* 11,944).

Refs.—AMSINCKIA SPECTABILIS F. & M., Ind. Sem. Hort. Petrop. 2:1 (1835), type loc. Bodega Bay, Sonoma Co. *A. maritima* Eastw., Proc. Cal. Acad. ser. 3, 1:110 (1898), type loc. San Nicolas Isl., *Trask*. *A. lycopsoides* Greene, Man. Reg. S. F. Bay 262 (1894); Jepson, Fl. W. Mid. Cal. 448 (1901), ed. 2, 350 (1911); not Lehm. (1831). *A. intermedia* Mcbr., Contrib. Gray Herb. 49:7 (1917); Jepson, Man. 844 (1925); not F. & M. *A. nigricans* Brand; Fedde, Repert. Sp. Nov. 20:319 (1924), type loc. Bodega Bay, *Heller* 5614. *A. dimorpha* Suksd., Werdenda 95 (1931), type loc. not given, *K. Brandegee*. *A. ovata* Suksd., l.c., type loc. San Simeon Bay, *Palmer* 370. *A. cana* Suksd., l.c. 96, type loc. Santa Maria, *Eastwood* 355. *A. acuminata* Suksd., l.c., type loc. Morro Bay, *Eastwood* 15,104. *A. truncata* Suksd., l.c., type loc. Point Reyes, *Eastwood* 11,784. *A. celsa* Suksd., l.c. 97, type loc. San Simeon, *K. Brandegee*. *A. divaricata* Suksd., l.c., type loc. Surf, Santa Barbara Co., *Eastwood* 13,727. *A. inflatula* Suksd., l.c., type loc. Casmalia, Santa Barbara Co., *Eastwood* 790. *A. constricta* Suksd., l.c. 98, type loc. Santa Barbara, *Eastwood*. *A. fulgens* Suksd., l.c., type loc. Surf, Santa Barbara Co., *Suksdorf* 131. *A. oblongifolia* Suksd., l.c., type loc. Watt's sta., West Oakland, *Greene*. *A. granulosa* Suksd., l.c., type loc. Seaside, Monterey Co., *Eastwood* 160. *A. kelloggii* Suksd., l.c. 99, type loc. Lone Mt., San Francisco, *Kellogg & Harford* 758. *A. maculata* Suksd., l.c., type loc. Granada, San Mateo, *Eastwood* 4727. *A. littoralis* Greene; Suksd., l.c., type loc. San Diego, *Greene*. *A. mathewsii* Suksd., l.c., type loc. Fort Bragg, *Mathews* 121. *A. microsperma* Suksd., l.c. 100, type loc. Santa Catalina Isl., *T. Brandegee*. *A. leptosperma* Suksd., l.c., type loc. Point Lobos, San Francisco, *Jepson*. *A. latifolia* Suksd., l.c. 101, type loc. Bodega Head, Sonoma Co., *K. Brandegee*. *A. davyi* Suksd., l.c., type loc. San Francisco, *Davy*. Var. NICOLAI Jtn.; Munz, Man. 423 (1935). *A. sanctinicolai* Eastw., Proc. Cal. Acad. ser. 3, 1:109 (1898), type loc. San Nicolas Isl., *Trask*. *A. intermedia* var. *nicolai* Jepson, Man. 844 (1925). Var. MICROCARPA Jepson & Hoover. *A. microcarpa Greene*, Erythea 2:191 (1894), type from "s. Cal., but possibly in Mex.," *Coulter*. *A. dentata* Suksd., Werdenda 95 (1931), type loc. Santa Maria, *Munz* 9285. *A. ochroleuca* Suksd., l.c., type loc. Nipoma Mesa, San Luis Obispo Co., *Eastwood* 14,331.

AMSINCKIA LYCOPSOIDES Lehm., Delect. Sem. Hort. Hamburg 7 (1831), no locality given; F. & M., Ind. Sem. Hort. Petrop. 2:1 (1835); Linnaea 11: Litt.-Ber. 93 (1837); Jepson, Man. 844 (1925). *Lithospermum lycopsoides* Lehm., Pugill. 2:28 (1830); Hook., Fl. Bor. Am. 2:89 (1838), type loc. "Straits of de Fuca, Nw. Am.," *Scouler*. *Benthamia lycopsoides* Lindl.; DC., Prodr. 10:117 (1846). Although often attributed to California, no Californian material has been seen which, under the present view, can be referred to it. It seems closely related to A. spectabilis.

AMSINCKIA MENZIESII Nels. & Mcbr., Bot. Gaz. 61:36 (1916). *Echium menziesii* Lehm., Pugill. 2:29 (1830); Hook., Fl. Bor. Am., 2:89 (1838), "N. W. Coast of America," *Menzies*. No satisfactory material seen; its identity seems wholly obscure.

11. **OREOCARYA** Greene

Perennial herbs, the stems mostly sparingly leafy, arising from the densely leafy root-crown and terminating in a thyrsoid or spicate leafy-bracteate panicle. Entire plant tomentose or strigose, and also usually densely spreading-hispid. Calyx 5-parted to the base or nearly so, the segments linear-lanceolate or ovate-lanceolate. Corolla white or cream-color, with prominent crests, the crests usually yellow or cream-color. Nutlets smooth and polished or roughened and dull, rounded on the back or quite flat, not keeled or with only a median lineation, the margins without wings or the wings extremely narrow.—Species 35, North America. (Greek oreos, mountain, and karua, nutlet, on account of the habitat.)

A. Nutlets roughened on back.

Corolla-tube not exceeding the calyx or only slightly.
  Ventral groove of nutlet extending to base or nearly; nutlets compressed, the pericarp papery; Sierra Nevada and n. Cal.
    Flowers in a dense terminal cluster with scattered small clusters or solitary flowers below.
      Stems slender, 3 to 11 inches high; nutlets 1 to 1½ lines long, the ventral groove closed or narrow........1. *O. nubigena*.
      Stems stoutish, 8 to 13 inches high; nutlets 2 lines long, the ventral groove broad...... 2. *O. crymophila*.
    Flowers in a cylindric or subcylindric panicle, the panicle usually dense; nutlets somewhat rounded dorsally, convexly 2-planed ventrally, the pericarp usually firm...... 3. *O. humilis*.

Ventral groove of nutlet ending about ¼ the distance from base; e. Mohave Desert and Inyo Co.
  Stems several to many, caespitose on a branched perennial root-crown; panicle narrow, the branches short, few-flowered; nutlets whitish............................4. *O. tumulosa.*
  Stems 3 or 2 from a simple biennial root; panicle broad, the branches many-flowered, somewhat elongated; nutlets light gray..5. *O. virginensis.*
Corolla-tube well exserted (1½ to 2 times as long as calyx); Inyo Co....... ....6. *O. flavoculata.*

B. Nutlets smooth.

Stems erect; leaves very much shorter than the panicles; Inyo Co. and e. Mohave Desert and bordering ranges..7. *O. confertiflora.*
Stems prostrate or decumbent; leaves mostly exceeding the panicles; San Bernardino and White mountains.......... ....8. *O. abortiva.*

1. **O. nubigena** Greene. Stems slender, erect but somewhat flexuous, sparingly leafy, 1 to several from the densely leafy and much-branched root-crown, 3 to 11 inches high; herbage thinly strigose and also spreading-hispid, the leaves dark-colored; leaves 1 to 2½ inches long, the blades narrow-obovate to spatulate, narrowed to a petiole 1 to 1½ times as long; flowers in terminal dense head-like clusters, the heads 5 to 8 lines broad, densely bristly-hispid, leafy-bracteate, usually with supplementary solitary flowers in the upper leaf-axils; calyx-lobes lanceolate or linear; corolla white, 2 to 3 lines long, ¾ to 1½ lines broad, the tube little or not at all exserted, the throat with prominent crests; nutlets brown or clay-color, long-ovate, flat on the back, sparingly rugose or tuberculate or smoothish, narrowly wing-margined, the groove narrow or closed at maturity.

Gravelly ridges and rocky summits, 7500 to 12,000 feet: southern Sierra Nevada from Tuolumne Co. to Tulare Co. June-Aug.

Geog. note.—Oreocarya nubigena is a high-altitudinal species with a broad densely leafy root-crown, slender somewhat flexuous stems, small flowers in densely bristly small heads, and rather soft or papery texture to the pericarp of the nutlet. Authentic material from the type locality, Clouds Rest above Yosemite, is well matched by collections from the southern Sierra Nevada, which have passed or would pass under the name Oreocarya clemensae. The following stations for Oreocarya nubigena may be cited: Parker Pass, Tuolumne Co., *A. L. Grant* 1609; Kaiser Peak, Fresno Co., *A. L. Grant* 1048; Palisade Creek, Fresno Co., *E. Ferguson* 516; Mt. Whitney, *Jepson* 1066. All the above collections are cismontane. Transmontane plants or plants from high easterly crests of the northern Sierra Nevada, with somewhat stoutish, somewhat rigid stems, cylindric inflorescences and larger corollas, heretofore included by the author and by Payson in the species here called Oreocarya nubigena, are in this work referred to Oreocarya humilis. However, the following transmontane collection is referred to O. nubigena: Mt. Patterson, Sweetwater Mts., Mono Co., *Hoover* 5547.

Refs.—OREOCARYA NUBIGENA Greene, Pitt. 3:112 (1896), type loc. Clouds Rest, Yosemite, *Chesnut & Drew;* Jepson, Man. 845 (1925). *Cryptantha nubigena* Payson, Ann. Mo. Bot. Gard. 14:265 (1927). *C. clemensae* Payson, Ann. Mo. Bot. Gard. 14:267 (1927), type loc. Glenn's Pass, Fresno Co., *Clemens.*

2. **O. crymophila** (Jtn.) Jepson & Hoover comb. n. Stems several from a woody branched root-crown, erect or suberect, 8 to 13 inches high, puberulent and spreading-bristly; leaves oblanceolate or linear, 1 to 4 inches long, puberulent and ascending-hirsute, the cauline with the blades narrowed to a subsessile base, the lower or basal ones with the blades gradually narrowed to petioles as long; inflorescence very bristly; terminal flower-cluster dense, several-flowered, the lateral clusters axillary and scattered or discrete, one or few-flowered; corolla white, 2 to 3 lines broad, its tube equaling or slightly exceeding the calyx-lobes; fruiting calyx 5 to 6 lines long, its lobes erect, bristly; style ⅓ longer than nutlets; nutlets long-ovate or ovate-lanceolate, strongly compressed, narrowly winged, irregularly and weakly rugulose dorsally; ventral groove open.

Rocky slopes, 9000 to 10,000 feet: ridge between Clark Fork and Middle Fork of Stanislaus River, Sierra Nevada of Alpine Co. July.

Endemism note.—As thus far known Oreocarya crymophila is an endemic of especial interest which in the high Sierra Nevada replaces Oreocarya nubigena north of Parker Pass. Only the following stations are known: Bald Peak, *Hoover* 4465; Red Peak; betw. Sonora Pass and Sonora

Peak, *Hoover* 4454. It is closely allied to Oreocarya nubigena, the nutlets of which are essentially similar in shape, surface features and general appearance. Comparison with fully mature material of O. nubigena, when collected, will have decisive effect on the status of O. crymophila.

Refs.—OREOCARYA CRYMOPHILA Jepson & Hoover. *Cryptantha crymophila* Jtn., Jour. Arn. Arb. 21:65 (1940), type loc. Red Peak, Alpine Co., *Hoover* 4193.

3. **O. humilis** Greene. Stems few, erect or ascending, leafy, 3 to 9 inches high, arising from the densely leafy root-crown; herbage (especially the leaves) silky-tomentose and also spreading-hispid throughout; leaves ¾ to 1¾ inches long, the blades obovate to spatulate, obtuse, drawn down to petioles 1 to 2 times as long; flowers in a spike-like or cylindric thyrse, leafy-bracteate below; calyx-lobes ovate-lanceolate, densely hispid; corolla white, 4 lines long, the limb 3 lines broad and crests prominent, its tube not exceeding or little exceeding the calyx; nutlets crowded dorsally with fine tubercles or fine short rugae or both.

Montane ridges and cañons, 5000 to 8000 (or 10,400) feet: Sierra Nevada (east side or easterly summits) from Mono Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges in southwestern Siskiyou Co. East to Nevada, north to Oregon. June-July.

Geog. note.—Oreocarya humilis, mainly transmontane or essentially so in the central Sierra Nevada and northward, is mostly high montane. It occurs at 9900 feet on the slopes east of Blue Lake, Virginia Lakes basin, western Mono County (*Peirson* 11,184), at 10,400 feet near Moat Lake in the same region (*Peirson*) and in Sonora Pass (*D. R. Goddard* 1418) at about 9500 feet. Thence northward as follows: betw. Truckee and Tahoe, Placer Co., *Sonne* 391; Donner Pass, Nevada Co., *Kellogg;* Castle Peak, Nevada Co., *Sonne;* Diamond Mt. (sw. of), ne. Plumas Co., *Stebbins & Jenkins* 2267. More northerly stations (North Fork Parker Creek, Warner Mts., *Taylor & Bryant;* Deep Creek, Warner Mts., *L. S. Smith* 1114; Caldwell Butte, e. Siskiyou Co., *Applegate* 9486; Mt. Eddy, sw. Siskiyou Co., acc. Jour. Arn. Arb. 20:394,—1939) represent Cryptantha (Oreocarya) subretusa Jtn., a newly proposed unit. Apparent differences between Oreocarya humilis Greene and C. subretusa Jtn. would seem to be as follows: the nutlet of Oreocarya humilis, perhaps a little triangular-ovate, has, when mature, a thickened or lineate margin not extending around base, whereas the nutlet of O. subretusa, perhaps ovate-lanceolate, gives the appearance of a thinner slightly broader wing extending around the base. Such possible differentiae do not, however, even on the basis of present material, seem sound. The wing of the nutlet apparently varies in breadth with age, tending to become narrower towards maturity as the embryo grows. Young nutlets usually have a more obvious wing than fully matured ones. One may consider the collection from Sonora Pass (*Brewer* 1887), here unhesitatingly referred to O. humilis: the nutlets are distinctly ovate-lanceolate and have a rather broad wing but are very young. No available material of C. subretusa has fully ripe nutlets. Indeed, all of the above-cited collections, including those cited for O. humilis, are in flower; although some have very young fruits and a few full-sized fruits, only one collection has mature fruits. All of the available California material, which is here thought to represent C. subretusa, is like O. humilis in habit, in size of plant, in leaves and distribution of leaves, in pubescence, inflorescence and flowers.

Refs.—OREOCARYA HUMILIS Greene, Pitt. 3:112 (1896). *Eritrichium glomeratum* var. *humile* Gray, Proc. Am. Acad. 10:61 (1874), no precise locality given, but by a process of restriction I. M. Johnston (Contrib. Arn. Arb. 3:87) has logically defined the type locality as Summit sta. (that is, Donner Pass, Nevada Co.), *Bolander*. *Cryptantha humilis* Payson, Ann. Mo. Bot. Gard. 14:278 (1927). *O. echinoides* Mcbr., Contrib. Gray Herb. 48:31 (1916), (excluding Utah plants); Jepson, Man. 845 (1925); not Krynitzkia echinoides Jones, Proc. Cal. Acad. ser. 2, 5:709 (1895), type loc. Pahria Cañon, Utah, *Jones* 5279p. *Cryptantha subretusa* Jtn., Jour. Arn. Arb. 20:393 (1939), type loc. Crater Lake, Ore., *Thompson* 12,206.

4. **O. tumulosa** Payson. Stems 1 to several from the root-crown, erect, 4 to 8 inches high; herbage puberulent and also hispid throughout with spreading tawny-yellow or white hairs, the ones on lower part of plant often discoid-dilated at base; leaves mostly in a basal tuft, a few cauline, 1 to 1½ inches long; leaf-blades obovate, attenuate to a petiole 1 to 2 times as long; panicle subcylindric, often somewhat dense, 2 to 4 inches long; corolla white, 2 lines long, the tube about equaling the linear calyx-segments; nutlets ovate or pyriform, rather flattened, narrowly and sharply margined, sparingly and coarsely tuberculate or rugose dorsally, 1½ to 2 lines long.

Gravelly ridges of desert ranges, often in the piñon belt, 4500 to 6000 feet: eastern Mohave Desert. May-June.

Tax. note.—The distinctions offered as between Oreocarya tumulosa and O. humilis seem unreliable, but the following collections may be cited as O. tumulosa: Gilroy Cañon, Providence Mts., *Mary Beal* 821; Barnwell, New York Mts., *K. Brandegee;* Ivanpah Mts., *Parish* 10,243.

Refs.—OREOCARYA TUMULOSA Payson, Univ. Wyo. Publ. Bot. 1:164 (1926), type loc. Providence Mts., *T. Brandegee. Cryptantha tumulosa* Payson, Ann. Mo. Bot. Gard. 14:276 (1927). *O. echinoides* Jepson, Man. 845 (1925), in part.

5. **O. virginensis** Mcbr. Stems 2 to 4 from the base, the central stem usually dominant with the others shorter or supplementary, all from the crown of the taproot, 6 to 14 inches high, the leaves chiefly basal, a few cauline; herbage finely strigulose and with rather long bristly spreading hairs, the bristly hairs on the leaves arising from a pustulate disk; leaves 1¼ to 3 inches long, the blades obovate to oblanceolate, drawn gradually down to a petiole 1 to 2 times as long; spikes shortly peduncled, borne along the stems from a little above the base to the summit, forming dense panicles 5 to 10 inches long and 1 to 2½ inches wide; calyx-segments lanceolate, as long as corolla-tube; corolla white, 5 lines long, the limb 3 lines broad; nutlets ovate, narrowly winged, ridged dorsally and rugose-reticulate, the irregular areolae minutely tuberculate.

Benches and cañon slopes of desert ranges, 4000 to 6000 feet: Inyo Co. East to Utah. May.

Locs.—Johnson Cañon, Panamint Range, *Jepson* 19,618; Hanaupah Cañon, Panamint Range, *Jepson* 6969; Keane Spr., Funeral Mts., *Peirson* 9948; Bee Springs Cañon, Inyo Mts., *Mark Kerr* 124; Waucoba Pass, Inyo Mts., *J. Grinnell* 1019a.

Refs.—OREOCARYA VIRGINENSIS Mcbr., Proc. Am. Acad. 51:547 (1916). *Krynitzkia glomerata* var. *virginensis* Jones, Contrib. W. Bot. 13:5 (1910), type loc. La Verkin, Washington Co. (in the Rio Virgin country, whence the varietal name), Utah, *Jones* 5195a. *Cryptantha virginensis* Payson, Ann. Mo. Bot. Gard. 14:274 (1927). (?) *C. hoffmannii* Jtn., Contrib. Arn. Arb. 3:90 (1932), type loc. Westgard Pass, Inyo Co., *Hoffmann* 78.

6. **O. flavoculata** Nels. Stems few to several from the branched root-crown, ascending or erect, 4 to 10 inches high, spreading bristly-hirsute and also finely strigulose; leaves chiefly basal, a few cauline, ½ to 3 inches long; leaf-blades oblanceolate, acute, densely whitish silky-strigose, gradually drawn down into petioles ½ to as long; panicles broadly cylindric to subcapitate, dense above, loose below, ½ to 4 inches long; corolla white or cream-color, 5 to 6 lines long, its limb 3 to 4 lines broad, its tube 1½ to 2 times as long as the lanceolate calyx-lobes; stamens borne at summit of corolla-tube; nutlets transversely rugose, the rugae irregularly broken and developed into sharp tubercles.

Cañon bottoms and dry brushy montane slopes, 6500 to 7500 feet: Inyo Co. East to Utah and Wyoming. May-June.

Locs.—Panamint Range: Wild Rose Cañon, *Peirson* 9934. Nev.: Miller Mt., Mineral Co., *Shockley* 744.

Refs.—OREOCARYA FLAVOCULATA Nels., Erythea 7:66 (1899), type loc. Piedmont, Wyo., *A. Nelson* 4572. *Cryptantha flavoculata* Payson, Ann. Mo. Bot. Gard. 14:334 (1927). *O. shockleyi* Eastw., Bull. Torr. Club 30:245 (1903), type loc. Miller Mt., Mineral Co. (formerly included in Esmeralda Co.), Nev., *Shockley* 244 (isotyp. in Herbario Jepsoniano).

7. **O. confertiflora** Greene. Stems erect, ½ to 1½ feet high, few or several from a branched root-crown; herbage densely strigose-pubescent with silky hairs, above more or less hispid; leaves mostly in a basal tuft, the cauline scattered; leaf-blades oblanceolate to linear-lanceolate, acute, 1 to 3 inches long; blades of the basal leaves and the lower cauline ones drawn down to a petiole, the petioles white-silky; inflorescence very shortly spicate-glomerate, more or less interrupted below; calyx-lobes linear to lanceolate, markedly accrescent in fruit; corolla cream-color, 6 to 7 lines long, the limb 4 to 5 lines broad, the crests in throat prominent, the tube exceeding the calyx (usually 1½ times); stamens borne at middle of corolla-tube; nutlets ovate, sharply margined, keeled ventrally, rounded on the back, smooth and polished.

Rocky or gravelly slopes of arid mountains, often under pines, 5000 to 8750 feet: east slope and east side of the Sierra Nevada from Mono Co. to Inyo Co.;

southern Sierra Nevada in Tulare and Kern Cos.; San Bernardino Mts. (n. slope). East to Colorado and New Mexico. May-July.

Locs.—Mono Lake, *Ottley* 1070; Long Valley, betw. Bishop and Mammoth, Inyo Co., *K. Brandegee;* Olancha Mt., Tulare Co., *Hall & Babcock* 5270; Hunter Range, se. of Saline Valley, *S. W. Austin;* Wild Rose Cañon, Panamint Mts., *Parish* 10,167; Mt. Laura, Erskine Creek, Kern Co., *Purpus* 5323; Cactus Flat, San Bernardino Mts., *Parish* 4887.

Refs.—OREOCARYA CONFERTIFLORA Greene, Pitt. 3:112 (1896), type loc. Cushenbury Sprs., San Bernardino Mts., *Parish;* Jepson, Man. 845 (1925). *O. leucophaea* var. *confertiflora* Parish, Erythea 7:95 (1899). *Cryptantha confertiflora* Payson, Ann. Mo. Bot. Gard. 14:256 (1927). *O. lutea* Greene, Muhl. 2:240 (1906), Silver Cañon, White Mts., *Heller* 8211, nomen nudum; Fedde, Repert. Sp. Nov. 19:72 (1923).

8. **O. abortiva** Greene. Stems decumbent or prostrate, several from the root-crown, leafy, 3 to 5 inches long; herbage strigulose, also with a few scattered spreading bristly hairs; leaves 3 to 5 inches long, the blades linear-oblanceolate to linear, gradually drawn down to a petiole-like base, mostly exceeding the panicles; racemes short, leafy-bracteate, borne in a thyrsoid panicle, the panicle 1 to 2 inches long; calyx-lobes ovate-lanceolate, the tube very short; corolla white, 1½ to 2 lines long, the limb 1½ to 2 lines broad, the tube not exceeding the calyx; nutlets 1 to 4, ovate, smooth and polished, curved dorsally, the ventral side strongly and convexly 2-planed so as to make a high keel with the carina grooved on lower ⅔ and divergently forked below; scar linear, lying in the groove.

Gravelly montane flats, sometimes associated with Artemisia tridentata, 6500 to 10,200 feet: San Bernardino Mts. (towards the desert side); Inyo and Mono Cos. East to southern Nevada. June-July.

Locs.—Bear Valley, San Bernardino Mts., *Parish* 3694; Campito Mt., White Mts., e. Inyo Co., *Jepson* 7290; Hot Creek, below Fales Hot Sprs., Mono Co., *Hoover* 5448.

Refs.—OREOCARYA ABORTIVA Greene, Pitt. 3:114 (1896), type loc. Bear Valley, San Bernardino Mts., *Parish. Krynitzkia multicaulis* var. *abortiva* Jones, Contrib. W. Bot. 13:5 (1910). *O. suffruticosa* var. *abortiva* Mcbr., Proc. Am. Acad. 51:547 (1916); Jepson, Man. 845 (1925). *Cryptantha jamesii* Payson var. *abortiva* Payson, Ann. Mo. Bot. Gard. 14:250 (1927). *Hemisphaerocarya abortiva* Brand; Fedde, Repert. Sp. Nov. 24:61 (1927).

12. **GREENEOCHARIS** Gurke & Harms

Low or dwarfish densely branched annuals, the numerous branchlets ending in leafy spikes. Herbage hispid or canescent, staining paper with a purple dye. Calyx 5-cleft to the middle, the scarious tube circumscissile about midway, the upper part falling, the lower cupulate portion bearded with a densely hairy ring and persistent around the ovate nutlets. Corolla minute, white.—Species 1. (E. L. Greene, distinguished American botanist and writer on western borages, and Greek charis, grace or beauty.)

1. **G. circumscissa** Rydb. Stems few or several from the base, compactly much branched, forming low dense rounded or subglobose plants 1½ to 7 inches high and 1 to 8 inches broad; herbage with appressed or ascending hairs or (especially the stems) canescent; leaf-blades linear, alternate or some of the lower opposite, 3 to 7 lines long; flowers sessile in the axils of the leaves or crowded in leafy-bracteate clusters at the ends of the branchlets; calyx hispid (the long straight erect hairs forming a crowded band on lower portion of tube), angular, early circumscissile by a wavy margin; corolla 1 to 1½ lines long, ½ to ¾ line broad, the throat naked and open; nutlets ovate or lanceolate, rounded on the back, smooth or finely papillate, ½ line long, the angles very acute.

Sandy or gravelly soil of desert mesas or arid mountain slopes, 800 to 6000 (or 7500) feet: eastern slope or east side of the Sierra Nevada from Lassen Co. to Inyo Co.; southern Sierra Nevada in Tulare and Kern Cos.; central and western Mohave Desert and its westerly bordering ranges; western Colorado Desert. South to Lower California, east to Arizona, north to British Columbia. Argentina, South America. Apr.-July.

Locs.—Sierra Nevada (east slope or east side): Beckwith Pass, Lassen Co., *Jepson* 7761; Bishop, *Almeda Nordyke;* Cottonwood Creek, w. Inyo Co., *Purpus* 1930; Little Lake, sw. Inyo Co., *Jepson* 19,526; Walker Pass (2 mi. e.), *Jepson* 19,870. Cismontane s. Sierra Nevada: Volcano Creek, Tulare Co., *Hall & Babcock* 5459; Lloyd Mdws., Kern River, Tulare Co., *Jepson* 4896; Piute Mts., Kern Co., *C. N. Smith* 165. Mohave Desert: Essex, *Jepson* 18,164; Cedar Cañon, Mid Hills, Providence Mts., *Jepson* 18,338; Kessler Peak, Ivanpah Mts., *Jepson* 15,828; Twenty-nine Palms, *Jepson* 5969; Calico Wash, Calico Mts., *Jepson* 17,220; Barstow, *Jepson* 5397; betw. Johannesburg and Atolia, *Jepson* 19,524; Saltdale, *Jepson* 19,507; Mohave sta., *Heller* 7764; near Cajon Pass, *Jepson* 6126; Antelope Valley, *Davy* 2209. Ranges bordering the westerly sides of the Mohave Desert: Bisses sta., Tehachapi Mts., *Dudley* 459; Cuyama Valley, se. San Luis Obispo Co., *Axelrod* 258; Mt. Piños, Ventura Co., *Hall* 6578; Mt. Wilson, San Gabriel Mts., *Peirson* 174; Bear Valley, San Bernardino Mts., *Hall.* Western Colorado Desert: Pleasant Valley, Hexie Mt., n. of Indio, *Clary* 1170; San Felipe, e. San Diego Co., *T. Brandegee;* Mountain Springs grade, *Orcutt;* Signal Mt., *T. Brandegee.*

Var. **hispida** Mcbr. Herbage conspicuously and coarsely spreading-bristly.—Mesas or montane flats or slopes, 2500 to 10,000 feet: Sierra Nevada on east slope from eastern Nevada Co. to Inyo Co.; Sierra Nevada on west slope in Tulare and Kern Cos., but only in high easterly valleys or on high easterly peaks; central Mohave Desert.

Locs.—Sierra Nevada (e. slope): Bronco, e. Nevada Co., *Sonne* 483; Casa Diablo, Mono Co., *Congdon;* Centennial Flat, ne. of Coso Mts., Inyo Co., *Renner* 31; Horseshoe Mdw., Cottonwood Creek, w. Inyo Co., *Jepson* 942. Southern Sierra Nevada in Tulare and Kern Cos.: South Fork Mdw., South Fork Kern River, Tulare Co., *Jepson* 937; Piute Peak, Kern Co., *Purpus* 5304. Mohave Desert: Jimgrey sta., *Jepson* 15,564.

Refs.—GREENEOCHARIS CIRCUMSCISSA Rydb., Bull. Torr. Club 36:677 (1909); Jepson, Man. 846 (1925). *Lithospermum circumscissum* H. & A., Bot. Beech. 370 (1840), type loc. Snake Fort, Snake River, Ida., *Tolmie.* *Piptocalyx circumscissus* Torr.; Wats., Bot. King 240 (1871). *Eritrichium circumscissum* Gray, Proc. Am. Acad. 10:58 (1874). *Krynitzkia circumscissa* Gray, l.c. 20:275 (1885). *Wheelerella circumscissa* Grant, Bull. S. Cal. Acad. 5:28 (1906). *Cryptantha circumscissa* Jtn., Contrib. Gray Herb. 68:55 (1923). Var. HISPIDA Mcbr., Proc. Am. Acad. 51: 546 (1916), type loc. Mt. Whitney trail, *Culbertson* 4240. *Cryptantha circumscissa* var. *hispida* Jtn., l.c. 74:42 (1925). *Krynitzkia dichotoma* Greene, Bull. Cal. Acad. 1:206 (1885), type loc. betw. Boca and Verdi, *Curran.* *Piptocalyx dichotomus* Greene, Pitt. 1:60 (1887). *Wheelerella dichotoma* Grant, Bull. S. Cal. Acad. 5:28 (1906). *G. dichotoma* Mcbr., l.c. *Cryptantha dichotoma* Jtn., l.c. 68:55 (1923). *G. circumscissa* var. *dichotoma* Jepson, Man. 846 (1925).

13. **CRYPTANTHA** Lehm. NIEVITAS

Ours annuals, except one species perennial; some extra-limital species rarely biennials or perennials. Flowers sessile or rarely pedicelled, borne in short or elongated spikes. Calyx 5-parted to the base, as long as the corolla-tube, its lobes hirsute or bristly or both, in fruit usually closely embracing the nutlets, eventually deciduous from the stem. Corolla white, small (¼ to 3 lines broad). Nutlets 4 or 1, sometimes 3 or 2, smooth, papillate, tuberculate or muriculate, not rugose or partially so very rarely; back of nutlets not keeled or very rarely obscurely keeled; face of nutlets with a median groove from the apex to the scar near the base, the groove either open or closed and usually continued beyond the scar as a fork, the fork either open (areolate) or closed. Gynobase subulate, the nutlets attached to it from the scar half-way or wholly to the apex along the groove.—The foliage is often withered by fruiting time, sometimes by flowering time. The nutlets in one flower sometimes differ in size and sometimes in morphological character.—Species about 80, North and South America. (Greek kruptos, hidden, and anthos, flower, on account of the cleistogamous flowers in the original South American species.)

Tax. note.—The segregation of the multitudinous forms of Cryptantha into specific units depends mainly upon structural differentiation in the nutlets. Such differentiating characters may be determined with satisfaction only by means of truly mature fruits, since nutlets of full size, though lacking maturity, may show marked differences from fully grown nutlets, even on one individual. In those species where the normal number of nutlets is 4, some flowers may develop only 2 or 3 nutlets, or, again, where the normal number is 1, some flowers may occasionally produce 2 nutlets. Habit of the plant, form or disposition of the spikes, hairiness and size of calyx or size of corolla may sometimes furnish differentiating characters associated with nutlet characters, but ordinarily the nutlet affords the most reliable evidence in the way of specific segregation. The species of the group with winged margins to the nutlets or lineate margins are both constant in their characters and well-defined; such species are Cryptantha pterocarya, Cryptantha holoptera and Cryptantha inaequata. The dense tufts of soft hairs on the calyces in the case of Cryptantha barbigera and Cryptantha crinita help to confirm nutlet characters in these species. Sometimes one or two of the four nutlets differ constantly in size and sometimes in shape and thus give a definite clue to the species. Such clear cases of heteromorphism distinguish species or groups of species. On the other hand, when the four nutlets are of the same size and shape, such a condition is regarded as homomorphic, even though occasionally collections may exhibit fruit in which one or two of the nutlets, due to incomplete development, may be smaller than the others, as for example in Cryptantha muricata (Bald Mt., Greenhorn Mts., *C. N. Smith* 204). In our species generally the nutlets in shape may be ovate, lanceolate or obclavate; the dorsal and ventral sides may be flattish, low-rounded or high-rounded. The groove on the ventral side may be elevated with a plane surface on each side extending to the lateral angles; a ventral structure of this sort is here described as convexly 2-planed.

In general the homomorphic species exhibit a great degree of fluctuating variability in the nutlets: often in shape of the nutlets, frequently in surface sculpturing, commonly as to the number, form or disposition of the tubercles or murications, often in the lateral angles as being acute or obtuse, often also in the ventral groove and the amount of its basal forking. In consequence, the attempt to fix definite limits to species in this group is attended with many ever-renewed uncertainties and difficulties. Certain morphological features are recombined, it would seem, to a degree that is very great. It is one's experience that each new lot of material derived from the field alters, to some extent, the limits of species as previously worked out. Where accessions of new material are very considerable, one must, in each case, revise anew. In such a revision some new units may be set up, but some old ones may be reduced. By this method a certain stabilization of various species can be matured. If, on the other hand, there should be an assertion of fixed limits for certain species in various groups, all material just beyond these fixed boundaries would, in consequence, be used in automatically multiplying further units to an excessive degree. Holding narrowly or fixedly to the original concept of a published species, or to species limits as set forth in an initial revision, inevitably leads to an ever-lengthening file of units to be offered as new.

A. Nutlets tuberculate, papillate or muricate.

I. NUTLETS WITH OBTUSE OR ACUTE LATERAL ANGLES, NOT WINGED, THOUGH SOMETIMES WITH A MARGINAL RIDGE.

1. Nutlets normally 4 (rarely 1, 2 or 3 but always some plants in a given locality with 4 nutlets).

a. Nutlets all alike or differing very slightly in size.

Spikes loosely corymbose-paniculate or disposed in a narrow panicle or a much reduced panicle, or the spikes sometimes solitary.
  Calyx-bristles straight; corolla inconspicuous (¼ to ¾ line wide).
    Nutlets broadly triangular-ovate; lower leaves opposite; lower San Joaquin Valley.......... 1. *C. hooveri.*
    Nutlets ovate-rostrate; leaves alternate; transmontane or mostly high easterly meadows of Sierra Nevada.......... 2. *C. ambigua.*
  Calyx-bristles at tips of lobes a little curved; corolla 1 to 1½ lines broad; cent. Sierra Nevada foothills.......... 3. *C. mariposae.*
Spikes in clusters of 2 to 5, terminating the main branches, the clusters not bracteate at base, borne above the leaves (except sometimes in depauperate plants).
  Bristles on calyx-lobes dense, mostly recurved, the upper ones short and equal, the lower ones longer; montane, widely distributed.......... 4. *C. simulans.*
  Bristles or hairs on calyx-lobes straight, ascending or divergent.
    Fruiting calyx 1 to 2½ lines long; corolla 1½ to 3¼ lines broad; cismontane.
      Calyx in fruit only slightly surpassing nutlets; nutlets triangular-ovate, the lateral angles with an evident ridge toward base.......... 5. *C. muricata.*
      Calyx in fruit usually much surpassing nutlets; nutlets ovate-rostrate to lanceolate-attenuate, the lateral angles not ridged.......... 6. *C. intermedia.*
    Fruiting calyx 3 to 5 lines long; corolla ¼ to 1 line broad; transmontane deserts; (see also vars. under nos. 5 and 6).
      Calyx-lobes conspicuously and densely villous-tufted with long white hairs on lower half, the lobes also long-bristly; flowers spicate, the fruiting spikes 1 to 5 inches long; nutlets ovate-acuminate.......... 7. *C. barbigera.*
      Calyx-lobes short-silky inside, glabrous outside but bristly on the midrib; flowers glomerate-capitate, the fruiting heads or spikes ½ to 1 inch long; nutlets slender-cuneate or lanceolate-attenuate.......... 8. *C. nevadensis.*

b. Nutlets heteromorphous (at least in most flowers).

Calyx 1 to 2 lines long, its bristles straight; transmontane deserts.
  Spikes loosely flowered; calyx appressed to rachis, bearing short bristles, persistent; plants tall, with flexuous branches.......... 9. *C. dumetorum.*

Spikes densely flowered; calyx more or less spreading from rachis, bearing long bristles (some exceeding lobes), deciduous; plants low, with straight branches....10. *C. angustifolia.*

Calyx ½ line long, armed with uncinate bristles; cismontane..........11. *C. micromeres.*

2. Nutlets solitary (rarely 2 in some flowers).

Calyx in fruit erect or spreading.

Flowers on pedicels ½ to 1 line long; spikes very dense, the calyces so densely woolly or shaggy-hirsute as almost to conceal the flowers; s. Shasta Co..........12. *C. crinita.*

Flowers sessile or subsessile, not concealed by shaggy hairs.

Nutlets erect; transmontane deserts and bordering ranges.

Calyx bristly; corolla ¼ line broad (1 to 2 lines in var.); spikes loose.......... 13. *C. decipiens.*

Calyx densely silky-hirsute, the bristles none or few and short; corolla 1 to 1½ lines broad; spikes short and dense..........14. *C. utahensis.*

Nutlets horizontal; calyx soft-hairy; spikes loose; inner North Coast Range in Yolo, Lake and Colusa Cos..........15. *C. excavata.*

Calyx in fruit recurved; Inyo Co..........16. *C. recurvata.*

II. Nutlets with winged margins or projecting sharp margins; calyx more or less bristly; nutlets normally 4; transmontane deserts (no. 22 partly cismontane).

Spikes with the lower pedicels 1 to 3 lines long; nutlets unequal; stems conspicuously woody at base (perennial); transmontane deserts..........17. *C. racemosa.*

Spikes with the flowers sessile or subsessile or the pedicels only ¼ to ½ line long; stems not woody at base or rarely (annuals).

Nutlets with a very narrow or line-like margin; corolla inconspicuous (¼ to 1½ lines broad).

Nutlets homomorphous, light brown.

Spikes bracteate toward base; nutlets minutely papillate on the dorsal side, smooth on the ventral side..........18. *C. costata.*

Spikes bracteate throughout; nutlets minutely papillate on both sides.......... 19. *C. saxorum.*

Nutlets heteromorphous, white-papillate on a brown ground on both sides; spikes bractless or nearly so..........20. *C. inaequata.*

Nutlets rather broadly or at least obviously wing-margined.

All 4 nutlets winged, the wing reddish-brown (same color as body), entire; flowers on pedicels ¼ or ½ line long; corolla 1¼ lines wide..........21. *C. holoptera.*

All 4 nutlets winged or the fourth nutlet wingless or nearly so; wing of the nutlet white-chartaceous or light-colored, toothed or erose, the body grayish or slate-color; flowers sessile or subsessile.

Corolla ¼ to ½ line broad; wing of nutlet fimbriate-toothed or crenate, as broad as the lanceolate body..........22. *C. pterocarya.*

Corolla commonly 2 to 3 lines broad; wing of nutlet erose, ¼ to ⅓ as broad as the ovate body..........23. *C. oxygona.*

B. Nutlets smooth.

I. Hairs on calyx straight or essentially so and either erect, spreading or reflexed.

1. Ventral groove median.

a. Hairs on upper part of calyx erect, ascending or spreading.

Calyces without bristles, resembling woolly tufts, the hairs soft, all alike; fruiting calyces 1 line long; spikes bractless, short and dense, borne in 2s to 4s on slender or filiform peduncles; nutlet 1; transmontane deserts..........24. *C. gracilis.*

Calyces with spreading bristles and also with shorter ascending hairs.

Style less than half as long as nutlets; calyx ¾ to 1 line long, with a tuft of bristles toward base; spikes slender, flexuous or curved; nutlet 1, lanceolate, rostellate or attenuate; cismontane, Coast Ranges, Kern Co. and coastal S. Cal..........25. *C. microstachys.*

Style more than half as long as nutlets.

Nutlets most commonly lanceolate, acuminate or rostrate, less than half as broad as long.

Spikes ¼ to 3 inches long; Coast Ranges and coastal S. Cal.

Spikes bractless or with a few bracts near base, mostly ½ to 1½ inches long.

Nutlet 1, high-rounded on back and face (circular in cross-section), slender-rostrate; Lake and Napa Cos..........26. *C. hispidula.*

Nutlets 1 to 4, low-rounded on back, usually flattish on face, acuminate or attenuate; Coast Ranges and coastal S. Cal..........27. *C. clevelandii.*

Spikes bracteate, short and dense (¼ to ½ inch long); nutlets 4 (or 1); coast line..........28. *C. leiocarpa.*

Spikes 3 to 5 inches long; Colorado Desert..........29. *C. ganderi.*

Nutlets most commonly ovate, at least half as broad as long.

Spikes ¼ to 1 inch long, regularly set with many small bracts; nutlets 1 (or 2); coastal S. Cal. and transmontane deserts..........30. *C. maritima.*

Spikes bractless or with a few bracts near base; nutlets 4 or 3.

Corolla 1½ to 2¼ lines broad; nutlets truncate at base; calyx-lobes linear; s. Sierra Nevada and Tehachapi Mts..........31. *C. mohavensis.*

Corolla ¼ to ¾ line broad (1 to 1½ lines in var. of no. 32); nutlets mostly rounded at base.

Lateral angles of nutlets obtuse; calyx-lobes linear; Sierra Nevada and North Coast Ranges..........32. *C. torreyana.*

Lateral angles of nutlets sharply acute or with a lineate margin; calyx-lobes lanceolate; high montane in White Mts..........33. *C. watsonii.*

b. Hairs on upper part of calyx retrorse; nutlets 1 to 4, ovate-lanceolate or -attenuate; spikes subfiliform; inner Coast Ranges and Tehachapi Mts..........34. *C. nemaclada.*

2. Ventral groove excentric; corolla minute (⅛ to ¼ line wide).

Nutlets 4; plants 3 to 20 inches high; spikes in 1s, 2s or 3s, 1 to 5 inches long; widely distributed, mts. of cismontane Cal..........35. *C. affinis.*

Nutlet 1; plants 1 to 5 inches high; spikes very short (1 to 1½ lines long) in terminal glomerules and in the leaf-axils; east side or high easterly meadows of the Sierra Nevada..........36. *C. glomeriflora.*

II. HAIRS ON CALYX FALCATE-RECURVED OR FALCATE-DEFLEXED; NUTLET 1.

Nutlets ovate or lanceolate, high-rounded on back, low-rounded or flattish on face; calyx-lobes on upper half beset with short spreading curved hairs, at base armed with a tuft of long deflexed or spreading bristles or sometimes the bristles extremely reduced or the lobes merely short-hispidulose; stem erect, branched.

Fruiting calyces appressed to rachis; base of nutlet rounded or subacute; ventral groove not forked, ending in a small areola; cismontane, widely distributed..........37. *C. flaccida.*

Fruiting calyces spreading from rachis; base of nutlet truncate; ventral groove forked at base, with a large areola; inner North Coast Range and cent. and n. Sierra Nevada foothills..........38. *C. rostellata.*

Nutlets ovate, acute, flattened on both faces (compressed); calyx-lobes uniformly beset with short curved hairs; stem diffusely branched, the branches very slender or filiform; foothills surrounding the San Joaquin Valley..........39. *C. sparsiflora.*

1. **C. hooveri** Jtn. Stems several from the base, ascending, 3 to 6 inches high; herbage ascending-hirsute; leaf-blades linear or filiform, 5 to 11 lines long, the lower opposite; spikes very short and dense, borne on short branches and racemosely disposed so as to make a cylindric panicle, only the lowest flowers in each spike developing fruits, the abortive flowers crowded; calyx-lobes linear, a little lanceolate-dilated at base, densely ascending-hirsute and with long spreading bristles, 2¼ to 3 lines long; corolla minute (¼ line broad), somewhat concealed behind the bristly calyx-tips; nutlets 4 (sometimes 3 or 1), triangular-ovate, acute, truncate at base, thickly tuberculate on the low-rounded back, convexly 2-planed ventrally, the lateral angles sharply defined but a little obtuse, the ventral groove widely forked at base and making a broad areola.

Dry sandy flats, 10 to 250 feet: lower San Joaquin Valley from eastern Contra Costa Co. to Madera Co. May.

Locs.—Antioch, *K. Brandegee;* Waterford (13 mi. e. at Gebin ranch), Stanislaus Co., *Hoover* 2137; Chowchilla (8 mi. w.), Madera Co., *Hoover* 1247.

Ref.—CRYPTANTHA HOOVERI Jtn., Jour. Arn. Arb. 18:23 (1937), type loc. Chowchilla (8 mi. w.), Madera Co., *Hoover* 558 (isotyp. vidi).

2. **C. ambigua** Greene. Stem much branched from the base, erect, ½ to 1¾ feet high, ascending-hirsute or strigulose and spreading bristly-hirsute; herbage roughly spreading-hirsute throughout; leaf-blades linear, 1 to 1½ inches long, thinly hirsutulose and conspicuously bristly-hirsute, the bristles with pustulate-dilated bases; spikes commonly loose below, 1 to 2¾ inches long, borne in a corymbose panicle; calyx-lobes linear-lanceolate, densely and divaricately long-bristly and ascending-hirsute (especially on lower part); corolla 1 line broad; nutlets 4 or 3, ovate-rostrate, usually flattish on back, thinly tuberculate on a microscopically tessellate-papillate ground, the lateral angles obtuse, the ventral side convexly 2-planed.

Gravelly slopes or flats, 4800 to 5800 feet: Sierra Nevada from Nevada Co. to Modoc Co. and eastern Siskiyou Co. East to Utah, north to Washington. June-July.

Locs.—Truckee, *Sonne;* Portola, Plumas Co., *K. Brandegee;* Goose Lake, ne. Modoc Co., *Austin & Bruce* 2267; Little Shasta Valley, *Jepson* 19,992; Andesite sta., n. of Mt. Shasta, *Jepson* 20,028.

Var. echinella (Greene) Jepson & Hoover comb. n. Stem erect, branching, 2 to 12 inches high; spikes solitary or somewhat capitate or glomerate at first with the spikes soon loose and the flowers remote or discrete; calyx-lobes linear-lanceolate or filiform, densely villous-ciliate, the strong midrib armed with long scattered spreading bristles; calyx in fruit 2 lines long; corolla minute, ⅓ to ¾ line broad; nutlets narrow-ovate, shortly attenuate or rostellate, minutely but rather thickly muriculate (the muriculations like needle-points), the lateral angles obtuse, the ventral side with mostly closed groove and closed basal fork.—Dry gravelly ground in open woods or on open sandy hills, 2400 to 9000 feet: Sierra Nevada, east side and east slope, and also west slope but mostly on high or easterly summits, from eastern Nevada Co. to Inyo and Tulare Cos.; Mt. Piños region to the San Bernardino Mts. East to Nevada and Arizona. July-Aug.

Locs.—Sierra Nevada, east side: Castle Peak, Nevada Co., *Heller* 7079; Tahoe City, *Boring;* Mammoth, Mono Co., *K. Brandegee;* Andrews Camp, Bishop Creek, Inyo Co., *K. Brandegee;* Tuber Cañon, Panamint Range, *Hovanitz.* Sierra Nevada, west slope: Relief Creek, Middle Fork Stanislaus River, *Hoover* 3657; betw. Pumice Flat and Shadow Lake, Madera Co., *Ferris* 8823; Bubbs Creek, Fresno Co., *Jepson* 806; Alta Mdws., Tulare Co., *K. Brandegee.* Intramontane S. Cal.: Sawmill Mt., n. Ventura Co., *Hall* 6523; Ontario Ridge, San Gabriel Mts., *Peirson* 3200; Little Green Valley, San Bernardino Mts., *G. R. Hall* 24.

Refs.—CRYPTANTHA AMBIGUA Greene, Pitt. 1:113 (1887); Jepson, Fl. W. Mid. Cal. 444 (1901), ed. 2, 347 (1911), Man. 848, excluding fig. 803 (1925). *Eritrichium muriculatum* var. *ambiguum* Gray, Syn. Fl. 2:194 (1878), resting initially upon *Eritrichium muriculatum* Torr., Phanerogamia of Pacific Coast, Wilkes Exped. 416, t. 13A (1874), type loc. Nisqually, Wash.; not E. muriculatum A. DC. *Krynitzkia ambigua* Gray, Proc. Am. Acad. 20:273 (1885). *C. polycarpa* Greene, Pitt. 1:114 (1887), type loc. Truckee, *Sonne.* Var. ECHINELLA Jepson & Hoover. *C. echinella* Greene, Pitt. 1:115 (1887), type loc. Castle Peak ("Mt. Stanford"), e. Nevada Co., *Sonne.*

3. **C. mariposae** Jtn. Stem branching, 3 to 8 inches high; herbage spreading- or ascending-hirsute; leaves oblong or oblanceolate, thickish, 4 to 8 lines long; spikes mostly few, corymbose, ½ to 1½ inches long; calyx-lobes linear, ascending-hirsute and spreading-bristly, the bristles towards the tip shorter and curved; corolla 1 to 1½ lines broad; nutlets 4 (or 2 or 3), ovate, rostrate from a broad body, truncate at base, low-rounded on back, convexly 2-planed on face, obtuse on the lateral angles, thickly or thinly tuberculate, the ventral groove with an open areola at base; style shorter than nutlets.

Serpentine rocks on hillslopes, 1000 to 2000 feet: Sierra Nevada foothills from Calaveras Co. to Mariposa Co. Apr.-May.

Locs.—Harmon Peak, Calaveras Co., *Davy* 1423; betw. Coulterville and Bagby, Mariposa Co., *Hoover* 3398; Mariposa, *Congdon.* The nutlets are quite similar to those of Cryptantha ambigua and in nearly all other respects Cryptantha mariposae is very close to that species, although it is well segregated from it geographically.

Ref.—CRYPTANTHA MARIPOSAE Jtn., Contrib. Gray Herb. 74:73 (1925), type loc. Mariposa, *Congdon.*

4. **C. simulans** Greene. (Fig. 416.) Stem slender, lankly or openly branching with very slender branches, 6 to 14 inches high; herbage ascending-hispid; leaf-blades linear, ½ to 1¼ inches long; spikes in 1s, 2s or 3s, ½ to 1¼ inches long; calyx-lobes narrowly linear and dilated at base or narrow-lanceolate, densely set with bristles, the bristles on upper half uniformly short and downwardly curved, the bristles on lower half longer and spreading or curved downward; corolla ¼ to ¾ line broad; fruiting calyx 2 lines long; nutlets 4, broadly ovate, shortly rostellate, brown, the flattish back with scattered tubercles set on a ground microscopically but densely tessellate-papillate, the angles rounded, the ventral groove and its basal fork closed.

Dry rocky or gravelly slopes or on flats in the mountains, in granite sand, 2000 to 6700 feet: mountains of Southern California; Tehachapi Mts.; Sierra Nevada from Kern Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges from Trinity Co. to western Siskiyou Co. East to western Nevada, north to Washington. May-July.

Locs.—S. Cal. mts.: Cuyamaca Peak, *T. Brandegee;* Onstatt Valley, San Jacinto Mts., *Hall;* Little Green Valley, San Bernardino Mts., *G. R. Hall;* Icehouse Cañon, San Antonio Mts., *Parish* 11,944; Mt. Wilson, San Gabriel Mts., *Peirson* 2157. Tehachapi Mts.: near Tehachapi Peak, *Dudley* 347. Sierra Nevada: Round Mdw., Giant Forest, *Jepson* 678; betw. Colony Mill and Marble Fork, Tulare Co., *Jepson* 664a; Huntington Lake, Fresno Co., *A. L. Grant;* Yosemite Valley, *Jepson* 10,467; Calaveras Big Trees, *Greene;* near Alpine Camp, upper Truckee River, Eldorado Co., *H. M. Wheeler;* Truckee, Nevada Co., *Heller* 7060; Milford, Lassen Co., *T. Brandegee;* Mt. Shasta, *T. Walker;* Fandango Pass, Warner Mts., *J. T. Howell* 12,043. North Coast Ranges: summit of New River trail, betw. Dyer's ranch and Hawkins Bar, Trinity Co., *Jepson* 1997; Sisson, Siskiyou Co., *Heller* 8035.

Refs.—CRYPTANTHA SIMULANS Greene, Pitt. 5:54 (1902), type loc. Amador Co., *Hansen. C. ambigua* Jepson, Man. fig. 803 (1925). *C. ambigua* f. *simulans* Brand; Engler, Pflzr. 4^{252}:68 (1931). *C. stuebelii* Brand; Fedde, Repert. Sp. Nov. 24:58 (1927), type loc. Yosemite Valley, *Stuebel.*

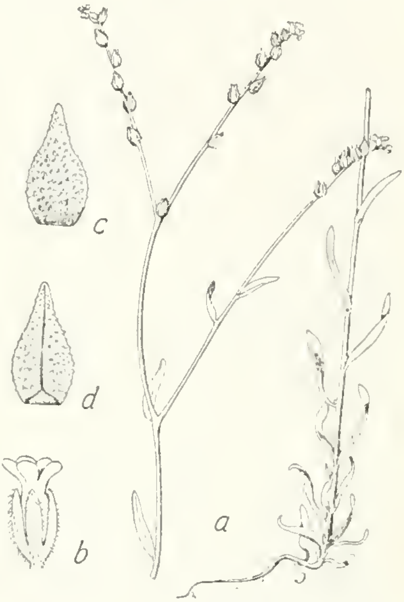

Fig. 416. CRYPTANTHA SIMULANS Greene. *a*, habit, × ½; *b*, fl., × 4; *c*, nutlet, dorsal view, × 8; *d*, nutlet, ventral view, × 8.

5. **C. muricata** Nels. & Mcbr. Stem robust, branching, ½ to 2 feet high; herbage spreading, rough-hirsute; leaf-blades linear, ½ to 1 inch long; spikes rather dense, borne in 2s to 5s (or 9s) terminally on the main axis or often also in 2s or 3s on the lateral branchlets; calyx-lobes lanceolate or linear, 1½ lines long, shortly ascending-hirsute and long spreading-bristly; corolla 2 to 3 lines broad; nutlets 4, triangular-ovate, acute, truncatish at base, 1 line long, tuberculate or muriculate dorsally and also sometimes somewhat rugulose, the lateral margins well-defined, ridged towards base, sometimes sharp or sometimes a little rounded, ventral side convexly 2-planed, the ventral groove and its strong basal fork mostly closed.

Gravelly or rocky open slopes or washes or opens in chaparral, 200 to 8000 feet: Coast Ranges from Contra Costa Co. to San Luis Obispo Co.; Sierra Nevada in Kern Co.; Tehachapi Mts.; intramontane and cismontane Southern California from Santa Barbara Co. to Orange Co. May-July.

Locs.—Coast Ranges: Mt. Diablo, *Bowerman* 808; Big Sur, Monterey coast, *Hoover* 2679; Cuyama Valley, se. San Luis Obispo Co., *Jepson* 12,158. Sierra Nevada in Kern Co.: Poso Mine, Poso Creek, Greenhorn Mts., *C. N. Smith* 189; lower Kern Cañon, Greenhorn foothills, ***Allison Krames.*** Tehachapi Mts.: Tehachapi, *K. Brandegee.* Intramontane and cismontane S. Cal.: Sycamore Cañon, Santa Barbara, *Jepson* 9135; Portal Ridge, n. Los Angeles Co., *Jepson* 17,065; Leonis Valley, n. Los Angeles Co., *Davy* 2648; Castaic Creek (mts. above), n. Los Angeles Co., *Jepson* 8933; San Gabriel Cañon, San Gabriel Mts., *Clokey* 5667; Waterman Cañon, San Bernardino Mts., *Jepson* 5524; Strawberry Valley, Mt. San Jacinto, *Jepson* 1299; Anaheim Plain, *Alice King.*

Note on fruit.—The nutlets, usually brown, are flattish dorsally and commonly carry an obscure median dorsal keel; usually the ventral side is convexly 2-planed though sometimes flattish. The groove is long-forked at base. The style about equals the nutlets. Variation in the surface sculpturing of the nutlets is marked. In the prevailing form the nutlet is densely tuberculate; or it may be thinly tuberculate; sometimes it is tuberculate and roughly sharp rugulose (Mt. Diablo, *Bowerman* 808,—det. R. F. Hoover). In the mountains on the west side of the Mohave Desert, the tubercles may be slender with the apex flat-topped and capped by a microscopic papilla (Cuyama Valley, *Jepson* 12,158), or some of the tubercles may be depressed or hollowed at apex with a definite papilla in the hollow (Portal Ridge, *Jepson* 17,065), or yet again the tubercle may become somewhat crater-like and bearing a distinct papilla in the crater (Portal Ridge, *Jepson* 17,059). In all these cases of crater-like tubercles, the tubercles rise from a brown ground. In the case of var. clokeyi (Jtn.) Jepson comb. n., the tubercles, likewise crateriform, are set on a whitish or lighter-colored ground and the calyx (3 to 3½ lines long) much surpasses the nutlets (n. of Barstow, Mohave Desert).

Var. jonesii Jtn. Stems 1 or few from the base, 5 to 20 inches high, ending in an umbellate cyme, the spikes below the cyme borne on short branches; corollas ¼ to ½ line broad.—Hillslopes, often in chaparral, 1000 to 5500 feet: Coast Ranges from Glenn Co. to Monterey Co.; Sierra Nevada from Nevada Co. to Kern Co.; intramontane and cismontane Southern California. South to Lower California, east to Nevada and Arizona.

Field note.—The most marked habital or biotypic form of Cryptantha muricata var. jonesii is developed in colonies which make open stands. The single stem axis of plants in uncrowded situations grows to a height of 1¼ to 2 feet and develops a terminal umbellate-cymose inflorescence of 3 to 9 spikes. Somewhat later, after the terminal cyme is established, the axis below becomes "feathered" with short branches which bear 1, 2, or 3 spikes. The "feathering" may be light or dense, in either case producing a narrow column, the main axis otherwise usually remaining unbranched. Such a growth form is characteristic of gravelly hilltops in Lake County, in Yosemite, in the San Gabriel Mountains, and other semi-arid stations.

Locs.—Coast Ranges: Alder Sprs. (9 mi. e.), w. Glenn Co., *Heller* 11,450; Blue Lakes, nw. Lake Co., *Jepson* 21,098; Cache Creek, n. of Lower Lake, Lake Co., *Jepson* 18,911; Reiff, Knoxville Ridge, se. Lake Co., *Jepson* 18,995; Hood's Peak, e. Sonoma Co., *Bioletti;* Mt. Tamalpais, *K. Brandegee;* Ben Lomond, Santa Cruz Co., *T. Brandegee;* Jamesburg, Monterey Co., *W. I. Follett* 73. Sierra Nevada: Bronco, e. Nevada Co., *Sonne* 396; Lettes sta., near Sonora Pass, *A. L. Grant* 134; South Fork Tuolumne River bridge, *A. L. Grant* 841; Snow Creek, Yosemite, *Jepson* 10,487a; Hospital Rock, Middle Fork Kaweah River, *W. Fry* 332; Kernville, *T. Brandegee.* Intramontane and cismontane S. Cal.: Arrastre Creek, San Gabriel Mts., *Peirson* 2476; Fontana, San Bernardino Valley, *Clokey* 5818; Cajon Cañon, *Jepson* 6097; Strawberry Valley, Mt. San Jacinto, *Jepson* 1298a; Elsinore (5 mi. n.), *Jepson* 12,429; Palomar Mt., San Diego Co., *Jepson* 1505a; Wagon Wash near Sentenac Cañon, e. San Diego Co., *Jepson* 12,487; San Diego, *Spencer* 38.

Refs.—CRYPTANTHA MURICATA Nels. & Mcbr., Bot. Gaz. 61:42 (1916). *Myosotis muricata* H. & A., Bot. Beech. 369 (1840), type from Cal., *Douglas. Eritrichium muriculatum* A. DC., Prodr. 10:132 (1846), a renaming (not Eritrichium muricatum A. DC., l.c.). *Krynitzkia muriculata* Gray, Proc. Am. Acad. 20:273 (1885). *C. muriculata* Greene, Pitt. 1:113 (1887); Jepson, Fl. W. Mid. Cal. 444 (1901), ed. 2, 347 (1911), Man. 848 (1925). *C. horridula* Greene, Pitt. 5:55 (1902), type loc. Salinas Valley. Var. CLOKEYI Jepson. *C. clokeyi* Jtn., Jour. Arn. Arb. 20:387 (1939), type loc. Barstow (n. of), *Clokey* 6859. Var. JONESII Jtn., Plant World 22:114 (1919). *Krynitzkia jonesii* Gray, Proc. Am. Acad. 20:274 (1885), type loc. Soledad, Monterey Co., *Jones. C. jonesii* Greene, Pitt. 1:113 (1887); Jepson, Fl. W. Mid. Cal. 445 (1901), ed. 2, 347 (1911). *C. vitrea* Eastw., Proc. Cal. Acad. ser. 3, 2:292 (1902), type loc. Bubbs Creek, Fresno Co., *Eastwood. C. muriculata* var. *vitrea* Jepson, Man. 848 (1925). *Krynitzkia denticulata* Greene, Bull. Cal. Acad. 1:205 (1885), type from w. Nev., *Curran. C. denticulata* Greene, Pitt. 1:114 (1887). *C. muricata* var. *denticulata* Jtn., Contrib. Gray Herb. 74:71 (1925).

6. **C. intermedia** Greene. Stem erect and branching above, or diffusely branched from base, ½ to 1 foot high; herbage hispid with both appressed and spreading hairs; leaf-blades lanceolate or linear, ½ to 1½ inches long, sessile or narrowed to obscure petioles; spikes usually in 2s or 3s, sometimes 4s or 5s, at first dense, soon loose, and 1 to 3½ inches long; calyx-lobes linear, ¾ to 1 line long, in fruit 1½ to 2½ lines long, densely villous-ciliate and villous inside, the back not villous but set with long scattered spreading bristles; corolla 1½ to 3¼ lines broad; nutlets 4 (3 or 2), ovate-rostrate or lanceolate-attenuate, obtusish at apex, densely and coarsely tuberculate dorsally and also ventrally, the lateral angles obtuse and tuberculate, the ventral groove closed or open, triangular-areolate or forked at base.

Sandy or gravelly valley floors or washes or on foothill slopes or rocky cañon bottoms, 200 to 6000 feet: Coast Ranges from western Siskiyou Co. to San Luis Obispo Co.; upper Sacramento Valley; Sierra Nevada foothills from Shasta Co. to Tuolumne Co.; western Mohave Desert; cismontane Southern California. South into Lower California. Apr.-June.

Locs.—Coast Ranges: Scott River Valley, w. Siskiyou Co., *Gilbert;* Hupa Valley, *Jepson* 2025; Paskenta, sw. Tehama Co., *Jepson* 16,317; Stonyford, w. Glenn Co., *Jepson* 16,291; Bell Cañon, Howell Mt., Napa Range, *Jepson* 18,861; Soledad, Monterey Co., *Congdon;* Templeton, San Luis Obispo Co., *Davy* 7596. Upper Sacramento Valley: Crane Creek, w. Tehama Co., *Jepson* 21,097; Chico (3 mi. n.), *Hoover* 2234; Marysville Buttes, *Heller* 11,368. Sierra Nevada foothills: Tamarack road at Stalker's, ne. Shasta Co., *M. S. Baker* 341; Willow Springs road sta., Amador Co., *Jepson* 15,226; San Antonio Creek, Calaveras Co., *Davy* 1567; Jacksonville, Tuolumne Co., *Hoover* 1957. Mohave Desert: Barstow, *Jepson* 5515. Cismontane S. Cal.: Santa Barbara, *Jepson* 9153; Ojai Valley, *Thacher* 39; Simi Valley, s. Ventura Co., *Jepson* 8460; San Fernando, *Jepson* 19,220; Arroyo Seco, San Gabriel Mts., *Peirson* 320; Arrastre Creek, San Gabriel Mts., *Peirson* 402; San Timoteo Cañon, *Jepson* 6084; San Gorgonio Pass, *Jepson* 17,079; Strawberry Valley, Mt. San Jacinto, *Jepson* 2267; Riverside, *Jepson* 1212; Anaheim plain, *Alice King;* Elsinore, sw. Riverside Co., *Jepson* 19,156; Aguanga, sw. Riverside Co., *Jepson* 17,159; Cootea, Palomar Mt., *Jepson* 1514; Escondido, *C. V. Meyer* 18; San Pasqual Valley, San Diego Co., *Jepson* 19,175; Mesa Grande, San Diego Co., *E. Ferguson* 31; Del Mar, San Diego Co., *Jepson* 1618; La Mesa near San Diego, *Jepson* 6689.

Var. **rigida** Brand. Corolla minute (¼ to ½ line broad).—San Joaquin Valley and its bordering foothills; southwestern Mohave Desert and bordering ranges.

Locs.—Inner South Coast Range: Tassajara Creek, near Mt. Diablo, *Hoover* 3348; Corral Hollow, Alameda Co., *Hoover* 3041; Tres Piños (4 mi. s.), *Ferris* 8336; Alcalde, sw. Fresno Co., *T. Brandegee;* McKittrick, Kern Co., *Heller* 7788; White Hills, se. San Luis Obispo Co., *Clokey* 5823. San Joaquin Valley: Huron, Fresno Co., *Eastwood;* Tulare, *Davy* 3132; Bakersfield, *Davy* 1875; Pampa sta., Kern Co., *Heller* 7645. Sierra Nevada: Long Barn (ridge above), Tuolumne Co., *Hoover* 2501a (det. R. F. Hoover); Poso Creek, Greenhorn Mts., *C. N. Smith* 62; Bodfish, Kern Co., *Jepson* 19,886. Tehachapi Mts.: Keene, *Jepson* 7159. Southwestern Mohave Desert and its bordering ranges: Palmdale to Little Rock, *Davy* 2291; Victorville (10 mi. s.), *Munz* 12,435; Baldwin Lake, San Bernardino Mts., *Fosberg* 10,689.

Var. **hendersonii** (Piper) Jepson & Hoover comb. n. Calyx-lobes linear, dark green, densely short-hispid and sparsely yellowish short-bristly, the midrib prominent; corolla 1½ to 3 lines broad; nutlets 1 or 2 (sometimes 3 or 4), ovate to ovate-lanceolate, sparingly and often obscurely tuberculate on a microscopically tessellate ground, or varying to quite smooth (even in the same colony), subflattish on back, the lateral angles obtuse or acute; ventral side convexly 2-planed, the groove closed or open.—Dry slopes or gravelly flats, 2500 to 4500 feet: northern Sierra Nevada (transmontane) from Lassen Co. to Siskiyou Co.: Milford, *T. Brandegee;* Surprise Valley, e. Modoc Co., *Jepson* 7843; Deep Creek, Warner Mts., *L. S. Smith* 1115; Andesite, Siskiyou Co., *Jepson* 20,029. North to Idaho and Washington.

Refs.—CRYPTANTHA INTERMEDIA Greene, Pitt. 1:114 (1887); Jepson, Man. 848 (1925). *Eritrichium intermedium* Gray, Proc. Am. Acad. 17:225 (1882), type loc. Los Angeles, *Nevin. Krynitzkia intermedia* Gray, l.c. 20:273 (1885). *C. intermedia* var. *johnstonii* Mcbr., Contrib. Gray Herb. 56:59 (1918), type loc. Claremont, Los Angeles Co., *Johnston* 1938. (?) *C. hansenii* Brand; Fedde, Repert. Sp. Nov. 24:58 (1927), type loc. Rancheria, Amador Co., *Hansen* 1728 (referred here by I. M. Johnston). *C. hansenii* var. *pulchella* Brand, l.c., type loc. Drytown, Amador Co., *Hansen* 1581. Var. RIGIDA Brand; Engler, Pflzr. 4^{252}:70 (1931). *C. nevadensis* var. *rigida* Jtn., Contrib. Gray Herb. 74:68 (1925), type loc. "hills bordering Mohave Desert," *Pringle.* Var. HENDERSONII Jepson & Hoover. *C. hendersonii* Piper; J. C. Nelson, Torreya 20:44 (1920). *Allocarya hendersonii* A. Nelson, Erythea 7:69 (1899), type loc. Potlatch River, Ida., *Henderson. C. grisea* Greene, Pitt. 5:53 (1902), type loc. Shasta Co., *Baker & Nutting.*

7. **C. barbigera** Greene. Stem freely branched from base, ½ to 1½ feet high; herbage hispid and hirsute; leaves oblong-linear to linear, ½ to 1½ inches long; spikes mostly rather dense, solitary or paniculate, becoming elongated (1 to 5 inches long), the flowers sometimes (at length) remote and less secund; calyx-lobes linear-attenuate, spreading at apex, densely armed (especially below) with long spreading bristles and also bearing on lower part a conspicuous white tuft of long-villous hairs; calyx in fruit 3 to 5 lines long; corolla ½ to 1 line broad; nutlets 4, 3 or 2, ovate, shortly acuminate, 1 line long, grayish-brown, mostly low-rounded dorsally, mostly convexly 2-planed ventrally, densely muriculate-tuberculate, the ventral groove forked at base.

Sandy soil of washes, cañon bottoms and mesas, 500 to 4000 (or 7400) feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. South into Lower California, east to Arizona and Utah. Mar.-Apr.

Note on type locality.—"Santa Barbara Co.," as the locality first cited by Asa Gray (Syn. Fl. 2:194) in the original description of this species, appears to be erroneous. There are no stations known to us in Santa Barbara County. There are, moreover, no specimens of this species in the Gray Herbarium from Santa Barbara County. The specimen on which the original citation rested (doubtless *Brewer;* cf. Bot. Cal. 2:469) is probably now referred elsewhere. In any event this matter is now resolved, since I. M. Johnston (Contrib. Gray Herb. 74:66) has selected "Utah, *Parry* 171," as the type.

Locs.—Inyo Co.: Silver Cañon, White Mts., *Heller* 8270; Quail Spr., left-hand fork of Johnson Cañon, Panamint Range, *Jepson* 19,745. Mohave Desert: Mitchell Caverns, Providence Mts., *Jepson* 18,220; Willow Sprs. (cove below), Old Dad Mts., *Jepson* 20,397; Kelso (5½ mi. ne.), *Jepson* 20,572; Paradise Mts. (4½ mi. ne.), *Jepson* 20,331. Colorado Desert: Berdoo Cañon, Conchilla Range, *Clary* 1167; Painted Cañon, Mecca Hills, *Jepson* 11,654; Palm Cañon of San Ysidro, *Jepson* 8805; Yaqui Well, e. San Diego Co., *Jepson* 17,115; Box Cañon, Blair Valley, e. San Diego Co., *Jepson* 8647; Vallecito, e. San Diego Co., *Jepson* 8626; Myers Creek bridge, sw. Imperial Co., *Jepson* 11,779.

Var. fergusonae Mcbr. Corolla 3 to 3¼ lines broad.—Palm Springs of Mt. San Jacinto, northwest Colorado Desert.

Refs.—CRYPTANTHA BARBIGERA Greene, Pitt. 1:114 (1887); Jepson, Man. 849 (1925). *Eritrichium barbigerum* Gray, Syn. Fl. 2:194 (1878), "S. California from Santa Barbara Co. to S. Utah and Arizona, *Parry, Palmer, Smart, Rothrock.*" *Krynitzkia barbigera* Gray, Proc. Am. Acad. 20:273 (1885), "only from the s. parts of Cal. and the adjacent w. part of Ariz." Var. FERGUSONAE Mcbr., Contrib. Gray Herb. 56:59 (1918), type loc. Palm Springs (of San Jacinto), *Margaret C. Ferguson* 42. *C. fergusonae* Brand; Fedde, Repert. Sp. Nov. 24:58 (1927).

8. **C. nevadensis** Nels. & Ken. Stems slender, flexuous or weak, branching, sometimes diffuse, 5 to 12 inches high; herbage appressed-hispid; flowers as if subcapitately glomerate on the ends of the branches, or the inflorescence sometimes becoming spicate and ½ to 1 inch long; calyx-lobes linear-filiform, densely short-silky on the inside and margins, the back glabrous or comparatively glabrous save that the midrib is set with scattered long spreading bristles; corolla ¼ line broad; calyx in fruit 3 to 4½ lines long; nutlets narrowly lanceolate-attenuate or narrowly cuneate, densely sharp-muricate on the flattish back, the ventral side muriculate-tuberculate, the angles rounded or obtuse; ventral side convexly 2-planed, the groove forked at base, partially open, or closed.

Sandy flats, mesas and cañon bottoms, often supported by desert bushes, 800 to 4000 feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. South into Lower California, east to Arizona, Nevada and Utah. Mar.-Apr.

Locs.—Inyo Co.: Black Cañon, White Mts., *Duran* 571; Hole-in-the-Rock Spr., Daylight Pass, Grapevine Mts., *Jepson* 19,806; Argus Range (n. end), *Jepson* 19,562; Hanaupah Cañon, Panamint Range, *Jepson* 6962; Johnson Cañon, Panamint Range, *Jepson* 19,602; Slate Range, *Allison Kramer.* Mohave Desert: Avawatz Mts., *Jepson* 17,321; Paradise Spr. (6 mi. ne.), Paradise Mts., *Jepson* 17,260; Calico Mts., *Jepson* 5407; Barstow, *Jepson* 5393; Newberry (lava sw.), *Newlon* 507a; Kelso, *Jepson* 20,571; Amboy Crater, *Jepson* 20,312. Colorado Desert: Deep Cañon, Santa Rosa Mts., *Clary* 1649; Vallecito, e. San Diego Co., *Jepson* 8547.

Refs.—CRYPTANTHA NEVADENSIS Nels. & Ken., Proc. Biol. Soc. Wash. 19:157 (1906). *Krynitzkia barbigera* var. *inops* T. Bdg., Zoe 5:228 (1906), type loc. Mohave Desert, *T. Brandegee. C. arenicola* Hel., Muhl. 2:242 (1906), type loc. Laws (3 mi. w.), Inyo Co., *Heller* 8203 (not "3203"). *C. barbigera* var. *inops* Mcbr., Proc. Am. Acad. 51:548 (1916); Jepson, Man. 849 (1925).

9. **C. dumetorum** Greene. Stem branching from the base, diffuse, 5 to 13 inches high, thinly appressed-hispid; leaf-blades linear-lanceolate to ovate, ½ to 1½ inches long, loosely hispid and conspicuously white-pustulate; spikes in 2s and 4s, at length loose, ½ to 4 inches long; calyx-lobes linear to narrow-lanceolate, warty-corrugated, the spreading or deflexed bristles arising from the warts; corolla ⅓ line broad; style about equaling nutlets; nutlets 4, narrow-lanceolate, 1 large and 3 (or 2 or 1) small, all thickly muriculate dorsally and ventrally, the angles obtuse, the ventral groove closed in the small nutlets, not forked but small-areolate at base; ventral groove in large nutlet broad, nearly covering ventral face; fruiting calyces appressed to rachis, 1¼ to 1½ lines long.

Desert flats or slopes of desert ranges, 1000 to 3500 feet: Conchilla Desert; western and central Mohave Desert. East to Nevada. Apr.-May.

Ecol. note.—Cryptantha dumetorum, usually an inhabitant of desert plains, is most commonly found growing under the protection of desert shrubs. The stems grow up through the shrub, flexuously spreading or reclining amongst its branches; they are weak and brittle and can be disengaged from the supporting twigs only with some difficulty.

The calyx is fleshy; its lobes, tending to be involute-teretish, are 4: the upper one (next the axis) is broad and cleft at apex, the 3 lower are narrow and entire. The 4 nutlets are equal or subequal at apex, but the large nutlet (next the axis) is inserted lower on the gynobase than the other three. It is sometimes smooth dorsally on lower part and its groove is always open, not only open but widely gaping, sometimes so wide as to cover almost wholly the breadth of the ventral face of the nutlet.

Locs.—Conchilla Desert: Whitewater sta., *Jones*. Mohave Desert: Lancaster, *K. Brandegee;* Kramer, *Parish* 9810; Randsburg, *K. Brandegee;* Barstow, *K. Brandegee;* Willow Spr. (cove below), Old Dad Mts., *Jepson* 20,393; Kelso sand dunes, *Jepson* 20,550.

Refs.—CRYPTANTHA DUMETORUM Greene, Pitt. 1:112 (1887). *Krynitzkia dumetorum* Greene; Gray, Proc. Am. Acad. 20:272 (1885), type loc. "Tehachapi Pass," *Curran*, that is, according to the collector, somewhere between "Tehachapi Pass" (the lower pass, in which Cameron sta. is situated) and Mohave sta. *C. intermedia* var. *dumetorum* Jepson, Man. 849 (1925).

10. **C. angustifolia** Greene. Stem erect or diffusely branched from or near the base, 2 to 8 inches high; herbage densely hispid with white hairs, the hairs commonly pustulate at base; leaf-blades narrowly linear, 3 to 12 lines long; flowers usually densely 2-ranked, the spikes ½ to 2 (or 3½) inches long, cymose-paniculate at ends of branches; calyx-lobes filiform or linear, densely short-villous with spreading hairs and with many spreading bristles, the bristles often yellowish and nearly as long as the calyx-lobes or sometimes longer; corolla minute (½ line broad); nutlets 4, ovate to lanceolate, ½ line long, 1 nutlet large and 3 (or 2) small or 2 large and 2 small, the back minutely and thickly papillate, the ventral groove (often open) usually widened downward into a triangular areola at base, the lateral angles rounded or sharply defined.

Brushy flats, sandy plains, washes or playas, –10 to 3500 feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. East to Utah and western Texas, south to Mexico. Mar.-May.

Locs.—Inyo Co.: Argus Range (n. end), *Jepson* 19,567; Emigrant Wash, Death Valley, *Jepson* 19,571. Mohave Desert: betw. Inyokern and Trona, *C. N. Smith* 70; Searles Lake, *Jepson* 7148; Tiefort Mt., *Jepson* 17,262; Barstow, *Jepson* 5386; Yermo, *Jepson* 15,866; Twenty-nine Palms, *T. Brandegee;* Lavic, *Jepson* 15,468; Kelso sand dunes, *Jepson* 20,547; Summit road sta., Marble Mts. (s. end), *Jepson* 18,152; Danby, *Jepson* 18,371; Essex, *Jepson* 18,156; Needles, *Jepson* 5482. Colorado Desert: Palo Verde Valley, *Schellenger* 17; Painted Cañon, Mecca Hills, *Jepson* 11,636; County Well, Conchilla Mts., n. of Indio, *Jepson* 6026; betw. Indio and Fargo Cañon, *Clary* 2067; Palm Sprs. of San Jacinto, *Jepson* 6062; Bailey Well, w. Imperial Co., *Jepson* 17,086; San Felipe Narrows, ne. San Diego Co., *Jepson* 12,540; Calexico, *Davy* 7955; Ft. Yuma, *Jepson* 11,738.

Refs.—CRYPTANTHA ANGUSTIFOLIA Greene, Pitt. 1:112 (1887); Jepson, Man. 847 (1925). *Eritrichium angustifolium* Torr., Pac. R. Rep. 5:363 (1857), "not rare in Cal.," more specifically Ft. Yuma, *Thomas* (cf. Contrib. Gray Herb. 74:39). *Krynitzkia angustifolia* Gray, Proc. Am. Acad. 20:272 (1885).

11. **C. micromeres** Greene. Stem rather widely branched at or above the base, 4 to 14 inches high, the branches very slender; herbage rough-hispid almost throughout with spreading dull-colored hairs; leaf-blades oblong to linear, ¼ to 1 inch long; spikes geminate to quinate, terminal or subterminal, bractless, not dense, 2 to 4 inches long; calyx ½ line long, its linear or lanceolate lobes armed with uncinate bristles as long as the calyx; corolla minute (⅓ line broad); nutlets 4 (or 3), triangular-ovate, acute, 3 (or 2) smaller, minutely white-muriculate on a light-brown ground, ⅓ line long, the fourth or odd nutlet dark brown and smooth or mainly so, 1¼ to 1½ times larger than the small ones; ventral groove open below middle and forked at base.

Sandy soil of hillslopes, rocky hilltops and mesas, frequent on chaparral "burns," 10 to 1000 feet: Sierra Nevada foothills from Amador Co. to Mariposa Co.; Coast Ranges (mainly the outer ranges) from Marin Co. to Monterey Co.; coastal Southern California from Santa Barbara Co. to San Diego Co. South to northern Lower California. Apr.-May.

Locs.—Sierra Nevada foothills: Drytown, Amador Co., *Hansen* 428; Gwin Mine, Calaveras Co., *Jepson* 1766; Coulterville (5 mi. w.), Mariposa Co., *Hoover* 3419. Coast Ranges: Mt. Tamalpais, *K. Brandegee;* Berkeley Hills, *Tracy* 2074; Mt. Diablo, *Bowerman* 1901; Soquel Cañon, Santa Cruz Mts., *Jepson* 21,125; Pajaro Hills, nw. Monterey Co., *Chandler* 439; Del Monte, Monterey Co., *Heller* 6698; Pt. Sur, Monterey coast, *K. Brandegee.* Coastal S. Cal.: San Marcos Pass, Santa Ynez Mts., *Jepson* 20,280; Santa Cruz Isl., *Margaret Stason;* Santa Catalina Isl., *T. Brandegee;* La Jolla, *Clements* 109; Pt. Loma, San Diego, *T. Brandegee* 1622.

Refs.—CRYPTANTHA MICROMERES Greene, Pitt. 1:113 (1887); Jepson, Fl. W. Mid. Cal. 445 (1901), ed. 2, 347 (1911), Man. 848 (1925). *Eritrichium micromeres* Gray, Proc. Am. Acad. 19:90 (1883), type loc. Santa Cruz, *Jones. Krynitzkia micromeres* Gray, l.c. 20:274 (1885).

12. **C. crinita** Greene. Stem rather strictly branched from near base, 7 to 12 inches high; herbage hirsute, the bases of the hairs on the leaves pustulate-discoid; leaf-blades linear, ½ to 1 inch long; spikes borne on very slender peduncles, very dense and densely woolly, the calyx-lobes so shaggy-hirsute as almost to conceal the individual flowers; flowers spreading, borne on pedicels ½ to 1 line long; calyx-segments linear, obtuse, in fruit 2½ to 3 lines long; corolla 1½ to 2 lines broad; nutlet 1, broadly ovate, rostrate, 1½ lines long, the low rounded back with a few scattered tubercles on a microscopically papillate-tessellate ground.

Gravelly creek bottoms, 450 to 550 feet: head of the Sacramento Valley in Shasta Co. Apr.-May.

Geog. note.—A remarkable species, both in aspect and technical character, Cryptantha crinita is a narrow endemic of the small stream beds of the Stillwater and Millville plains of Shasta Co., inhabiting an area perhaps not exceeding five by ten miles as at present known. Three stations are here cited: Stillwater Creek at Leighton, *M. S. Baker;* Salmon Creek bridge, 5 mi. e. of Redding, *Hoover* 2280; Cow Creek.

Refs.—CRYPTANTHA CRINITA Greene, Erythea 3:66 (1895), type loc. Cow Creek, Shasta Co., *M. S. Baker;* Jepson, Man. 849 (1925).

13. **C. decipiens** Hel. Stems several from the base, erect or ascending, slender, 4 to 12 inches high; herbage strigose or ascending-hispid; leaf-blades linear, ½ to 1 inch long; spikes ternate, very slender, slightly flexuous, in fruit somewhat loose or the calyces at least discrete; calyx-lobes linear-filiform, ascending-hirsute and hispidulose, the 3 outer armed on lower part with a dense tuft of deflexed or horizontally spreading bristles, the 2 inner densely hirsute at base with erect hairs; corolla minute (¼ line broad); fruiting calyx 2 lines long, the tips of the lobes spreading; nutlet 1, ovate and rostellate, or lanceolate and attenuate, papillate-dotted, or finely tuberculate and short-rugulose, the lateral angles obtuse, sometimes acutish.

Desert flats, sandy mesas and arid valleys, 500 to 4500 feet: southern Sierra Nevada in Kern Co.; Inyo Co.; Mohave and Colorado deserts. East to Nevada and Arizona. Mar.-May.

Locs.—Kern Co.: Kernville, *T. Brandegee.* Inyo Co.: Johnson Cañon, Panamint Range, *Jepson* 19,667. Mohave Desert: Hole-in-the-Wall, Providence Mts., *Jepson* 18,320a; Willow Sprs. (cove below), Old Dad Mts., *Jepson* 20,394; Paradise Mts. (4½ mi. ne.), *Jepson* 20,336. Colorado Desert: Whitewater River, *Jones;* Andreas Cañon, San Jacinto Mts., *Peirson* 2368a; Palm Cañon of San Ysidro, *Jepson* 8807; Blair Valley, e. San Diego Co., *Jepson* 8687; Coyote Wells (e.), Imperial Co., *Jepson* 11,758.

Var. corollata Jtn. Stems generally taller (6 to 18 inches high); herbage spreading-bristly; corolla 1 to 2 lines broad.—South Coast Ranges, towards the interior from Contra Costa Co. to Fresno Co. (peak e. of Tassajara Creek, near Mt. Diablo, *Hoover* 3347; Puerto Cañon, w. Stanislaus Co., *Hoover* 3364; San Miguelito Rancho, Jolon, Monterey Co., *Jepson* 1649; Alcalde, sw. Fresno Co., *T. Brandegee*); s. Sierra Nevada in Tulare Co. (North Fork Kaweah River, *K. Brandegee*); Tehachapi Mts. (Ft. Tejon,— Contrib. Gray Herb. 74:61), and south to Santa Barbara Co. (Roble Cañon, San Rafael Mts., *Hall*) and Ventura Co. (Ojai Valley).

Refs.—CRYPTANTHA DECIPIENS Hel., Muhl. 8:48 (1912). *Krynitzkia decipiens* Jones, Contrib W. Bot. 13:6 (1910), type loc. Yucca, Ariz., *Jones.* Var. COROLLATA Jtn., Contrib. Gray Herb. 74:61 (1925), type loc. Ojai Valley, Ventura Co., *Hubby* 21. *C. corollata* Jtn., Journ. Arn. Arb. 18:24 (1937).

14. **C. utahensis** Greene. Stem branched from base, the branches erect or with decumbent base, 6 to 19 inches high; herbage ascending-hispid; leaf-blades linear, ¼ to 2¼ inches long; spikes very short and dense (¼ to ½ inch long), glomerate in 2s and 3s or paniculate; calyx-lobes linear-lanceolate to oblong-lanceolate,

densely silky-hirsute with ascending hairs, not bristly or the few short slender bristles also ascending; corolla 1 to $1\frac{1}{2}$ lines broad; nutlets solitary, sometimes 2, adhering closely to the gynobase, ovate-acuminate or lanceolate, $1\frac{1}{4}$ lines long, finely muriculate on the flattish or curved back, convexly 2-planed ventrally, the angles acute or lineately white-margined, the ventral groove gradually widening toward the base or nearly closed; areola open, broadly forked; fruiting calyces spreading horizontally, equaling or only slightly exceeding the nutlet.

Desert washes or brushy rocky slopes, 500 to 5000 feet: Inyo Co., Mohave and Colorado deserts. East to southern Utah. Apr.-May.

Locs.—Inyo Co.: Black Cañon, White Mts., *Duran* 572; Alabama Hills near Lone Pine, *Renner* 60a; Santa Rosa Wash, pass betw. Inyo Mts. and Coso Mts., *Jepson* 19,535; Darwin Wash, near Keystone Mine, *Renner* 28; Argus Range (n. end), *Jepson* 19,561; Hole-in-the-Rock Spr., Daylight Pass, Grapevine Mts., *Jepson* 19,807; Hanaupah Cañon, Panamint Range, *Jepson* 6986; Johnson Cañon, Panamint Range, *Jepson* 19,614. Mohave Desert: Domingo ranch (near), Providence Mts., *Jepson* 18,277; Granite Mts. (s. of Avawatz Mts.), *Jepson* 17,294; Ord Mt., *Jepson* 5891. Colorado Desert: Cottonwood Spr., w. side Eagle Mts., *Jepson* 12,580; Palm Sprs. of San Jacinto, *Wilder* 870; Ebbens Wash, Santa Rosa Mts., *Clary* 2073.

Refs.—CRYPTANTHA UTAHENSIS Greene, Pitt. 1:120 (1887); Jepson, Man. 849 (1925). *Krynitzkia utahensis* Gray, Syn. Fl. 2:427 (1886), type loc. St. George, Utah, *Palmer*. *Eritrichium holopterum* var. *submolle* Gray, Proc. Am. Acad. 13:374 (1878), type loc. St. George, Utah, *Palmer*. *C. submollis* Cov., Contrib. U. S. Nat. Herb. 4:166 (1893).

15. **C. excavata** Bdg. Stem branching above the base, 5 to 9 inches high, the branches long and slender; herbage ascending-hispid, the hairs on the leaves with pustulate bases; leaf-blades linear, 3 to 9 lines long; spikes in 2s and 3s, becoming elongated and 1 to 4 inches long, the flowers rather remote; calyx-lobes linear, soft-hairy, furnished with a few slender short bristles, the tips of the lobes spreading; corolla 1 to $1\frac{1}{2}$ lines broad; nutlet 1, borne horizontally, strongly obcompressed and keeled dorsally, ovate-acuminate in side view, obscurely tuberculate on a microscopically papillate-tessellate ground, the ventral groove opening below into a large triangular areola, the areola deeply excavate; fruiting calyx $1\frac{1}{4}$ lines long, as broad as long.

Sandy banks in the hills, 300 to 1000 feet: inner North Coast Range from Yolo Co. to Colusa Co. Apr.-May.

Geog. note.—A species characterized by very remarkable nutlets, both as to structure and as to position in the calyx, Cryptantha excavata is an extremely narrow endemic with a longitudinal range of about twenty-nine miles. Detailed knowledge of its localized occurrence is almost wholly lacking and only three stations are here cited: Cache Creek Cañon, w. Yolo Co., *C. F. Baker* 2886; e. Lake Co., *K. Brandegee;* Sites, w. Colusa Co. The single nutlet is set horizontally in the calyx with the beak pointing outward from the axis and protruding between the two outer calyx-lobes.

Refs.—CRYPTANTHA EXCAVATA T. Bdg., Bot. Gaz. 27:452 (1899), type loc. Sites, Colusa Co., *K. Brandegee*. *C. abortiva* Greene; Baker, West. Am. Pls. 2:10 (1903), Cache Creek Cañon, w. Yolo Co., *C. F. Baker* 2886, nomen nudum.

16. **C. recurvata** Cov. Stem slender, more or less branched from base, 2 or 3 to 9 inches high, appressed-hispid; leaves with somewhat spreading hairs, the blades linear-oblanceolate, $\frac{1}{4}$ to $\frac{3}{4}$ inch long; spikes in 2s or 3s, bractless, becoming loose; calyx spreading, in fruit a little recurved, 1 to $1\frac{1}{2}$ lines long, the lower half densely bristly with stiff divergent hairs; calyx-lobes linear; corolla minute ($\frac{1}{3}$ line broad), scarcely exserted; nutlet 1, ovate-lanceolate, very finely papillate, rounded on the angles, slightly incurved at apex, carinate, $\frac{3}{4}$ line long, its pericarp fragile.

Sandy soil in cañons of desert ranges, 3000 to 5000 feet: Inyo Co. East to Utah, north to eastern Oregon. Apr.-May.

Locs.—Panamint Range; Coldwater Cañon near Laws, *K. Brandegee;* Silver Cañon, White Mts., *Heller* 8221.

Refs.—CRYPTANTHA RECURVATA Cov., Contrib. U. S. Nat. Herb. 4:165, t. 16 (1893), type loc. Surprise Cañon, Panamint Range, *Coville & Funston* 713; Jepson, Man. 847 (1925).

17. **C. racemosa** Greene. Stem profusely branched throughout, $\frac{1}{2}$ to 1 or 2 feet high, the ultimate branchlets almost filiform, the main stem and larger branches

woody; branches and leaves appressed-hispid and spreading-bristly, or the branches sometimes not bristly; leaf-blades linear, acuminate, ½ to 1 inch long; inflorescence loosely racemose-paniculate, the flowers on spreading pedicels, the pedicels ½ to 1 (or 3) lines long; calyx in fruit 1 line long, the segments lanceolate, spreading-bristly and appressed-hispid; corolla 1 line broad, constricted at throat; nutlets ovate-lanceolate, unequal, 1 larger (though sometimes abortive), 3 smaller and becoming free from the gynobase earlier, ½ line long, brown, the back sparsely white-dotted with tubercles and bordered by a narrow or white-lineate margin, the ventral groove open below the middle and gradually widening to base.

Gravelly washes, sandy plains or rocky walls of desert cañons, 100 to 4000 feet: Inyo Co.; Colorado Desert. South to Lower California, east to western Arizona and Nevada. Apr.-June.

Field note.—Cryptantha racemosa is coarsely woody at base. It forms a diminutive bush in which the main stems become ⅛ to ½ inch in diameter and the numerous branches are very closely interlaced, fully as closely and densely intertwined as those of Eriogonum heermannii. Sometimes this species is biennial but in California more frequently perennial. And by perennial is meant that the individual produces flowers in more than one season, a fact determinable by one who studies much the desert cañons. In its most extreme or well-developed form, Cryptantha racemosa is a depressed-globose plant which in aspect has a marked resemblance to some species of Galium. The older stems often display a papery bark which exfoliates and recalls Coldenia, while the branches are armed with small bristles which to the skin of the botanical explorer are penetrating and painful, suggesting the minute spicules of cacti.

Locs.—Inyo Co.: Inyo, *T. Brandegee;* Argus Range (n. end), *Jepson* 19,563; Titus Cañon, Grapevine Mts., *Jepson* 19,856; Funeral Mts., *Jepson* 6911; Surprise Cañon, Panamint Range, *Jepson* 7138; Johnson Cañon, Panamint Range, *Jepson* 19,742. Colorado Desert: Morongo Wash, *Parish* 3337; betw. Piñon Well and County Well, n. of Indio, *Jepson* 6013; Painted Cañon, Mecca Hills, *Jepson* 11,675; Cottonwood Spr., Eagle Mts., *Jepson* 12,580; Borrego Sprs., e. San Diego Co., *T. Brandegee;* San Felipe Narrows, e. San Diego Co., *Jepson* 12,525; Devils Cañon, e. San Diego Co., *C. V. Meyer* 421; Myers Creek bridge, w. Imperial Co., *Jepson* 11,797.

Refs.—CRYPTANTHA RACEMOSA Greene, Pitt. 1:115 (1887); Jepson, Man. 847 (1925). *Eritrichium racemosum* Wats.; Gray, Proc. Am. Acad. 17:226 (1882), type loc. Mesquite Cañon, above Mesquite sta., ne. Imperial Co. (formerly in San Diego Co.), *S. B. Parish* 775 ("W. F. Parish" also cited but did not go on this trip acc. S. B. Parish). *Krynitzkia racemosa* Greene, Bull. Cal. Acad. 1:208 (1885). *K. ramosissima* Gray, Proc. Am. Acad. 20:277 (1885), change of name. *Johnstonella racemosa* Brand; Fedde, Repert. Sp. Nov. 21:249 (1925). *C. racemosa* var. *lignosa* Jtn., Univ. Cal. Publ. Bot. 7:445 (1922), type loc. Panamint Cañon, Inyo Co., *Hall & Chandler* 7034. *Johnstonella racemosa* var. *lignosa* Brand, l.c. *C. suffruticosa* Piper, Proc. Biol. Soc. Wash. 32:42 (1919), type loc. Camp Muchacho, Colorado Desert, *Orcutt* 2070.

18. **C. costata** Bdg. Stems many from the base, freely branched, conspicuously leafy and densely white-hirsute when young, forming a roundish or bushy plant 3 to 10 inches high; herbage gray, appressed-hispid and with scattered spreading bristles; leaf-blades narrowly lanceolate-attenuate or coarsely filiform, ½ to 3 inches long, often surpassing the spikes; spikes dense, bracteate towards base, ½ to 1 inch long or reduced and head-like; flowers minute, the bracts and sepals closely beset with long rigid white or yellowish bristles with softer shorter hairs between; calyx-lobes narrowly linear-lanceolate, sparsely set with long spreading bristles and thinly short-hirsute; corolla ½ to 1 line broad; nutlets 4, light-brown, oblong-lanceolate, the back rounded and obscurely and very minutely papillate but the papillae shining, the angles sharp, obscurely whitish-lineate and slightly revolute so as to make on the smooth ventral side a shallow hollow on each side of the ventral groove; groove dilated from the middle downward.

Gravelly hillslopes and benches and in sand dunes, –250 to 1200 feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. East to Arizona. Feb.-May.

Locs.—Inyo Co.: Furnace Creek ranch, Death Valley, *J. Grinnell.* Mohave Desert: Rasor, Mohave River sink, *Jepson* 6869; Needles. Colorado Desert: Blythe jct., *Munz & Harwood* 3587; betw. Seaview and Salton Sea, *Clary* 2066; Mecca (sandhills ne.), *Parish* 8465; Borrego Sprs.

Refs.—CRYPTANTHA COSTATA Bdg., Bot. Gaz. 27:453 (1899), type loc. Borrego Sprs., w. Colorado Desert, *T. Brandegee;* Jepson, Man. 847 (1925). *C. seorsa* Mcbr., Contrib. Gray Herb. 48:46 (1916), type loc. Needles, *Jones* 3841.

19. **C. saxorum** Jepson sp. n. Stem widely branching from the base, 1½ to 2½ inches high, forming small plants 2 to 4 inches broad; herbage spreading-hispid, the hairs of the leaves pustulate-dilated at base; leaves lanceolate, sessile, 4 to 12 lines long; spikes short and dense (4 to 9 lines long), conspicuously bracteate; calyx short-bristly, densely tufted with white hairs at base; corolla ½ line wide; nutlets 4, equal, ovate, light brown, thinly papillate both sides, the marginal wing very narrow or lineate; dorsal side of nutlets low-rounded, the ventral side low but convexly 2-planed; ventral groove closed, with forked areola at base; style ¼ longer than nutlets.—(Planta pygmaea, 1½–2½ unc. alta, 2–4 unc. lata, e basi late diffusa; herba patenti-hispida, foliorum pilis basi pustulato-dilatatis; folia lanceolata sessilia, 4–12 lin. longa; racemi breves (4–9 lin.), densi, valde bracteati; calyx setis brevibus praeditus, basi pilis albis dense caespitosus; corolla ¼ lin. lata; nuculae 4, aequae, ovatae, pallido-fulvae, utrimque sparso-papillatae, ala marginali perangusta vel lineata; dorsum nuculae depresso-rotundatum, venter depressus tamen convexo-biplanus; sulcus ventralis occlusis, basi areola furcata; stylus ¼ longior nuculis.)

Lava hills, 3000 feet: near Tiefort Mt., eastern Mohave Desert. Apr.

Ref.—CRYPTANTHA SAXORUM Jepson; type loc. lava hill 1 mile sw. of Bicycle Lake, near Tiefort Mt., Mohave Desert, *Jepson* 20,350 (typ. in Herbario Jepsoniano).

20. **C. inaequata** Jtn. Stem erect, branching from the base or above, 5 to 12 inches high; herbage spreading-bristly, the bristles pustulate-dilated at base; leaf-blades narrowly linear or linear-oblanceolate, very dark green, ½ to 1¼ inches long; spikes soon somewhat loose, ¼ to 1½ inches long; calyx-lobes linear-filiform, short-villous and sparsely long-bristly; corolla ½ to 1½ lines broad; nutlets 4, ovate (the apex obtusish), 1 large and not evidently margined, 3 slightly smaller and with a narrow whitish margin, conspicuously sprinkled on back with whitish papillae on a brown ground, the ventral side convexly 2-planed, the ventral suture opening downward into an open forked areola; style ¼ longer than nutlets.

Rich soil pockets in cañon bottoms of rocky desert ranges or lava flats, 200 to 4000 feet: eastern Mohave Desert; eastern Inyo Co. East to Nevada. Apr.

Geog. note.—Cryptantha inaequata represents a case of an adequate but long unrecognized species which masqueraded, so to speak, in the shadow of C. holoptera. Its nutlets, too, save for the lineate margin, resemble closely the smaller nutlets of the four in Cryptantha angustifolia. Cryptantha inaequata has, however, the advantage of differentiating characters other than those of the nutlet. That it escaped critical notice previous to 1922 is due, doubtless in part, to its rarity. Even to this time few collections have been made.—Eastern Mohave Desert: Lavic, *Jepson* 15,456; Baxter, *Parish* 9859. Inyo Co.: Argus Range (n. end), *Jepson* 19,551; Furnace Creek wash, Funeral Mts., *Jepson* 6936.

Refs.—CRYPTANTHA INAEQUATA Jtn., Univ. Cal. Publ. Bot. 7:444 (1922), type loc. Pleasant Cañon, Panamint Range, Inyo Co., *Hall & Chandler* 6925. *Johnstonella inaequata* Brand; Fedde, Repert. Sp. Nov. 21:250 (1925).

21. **C. holoptera** Mcbr. Stem erect, branching, ½ to 1½ feet high; herbage grayish, the leaves and stems spreading-bristly, the stems also appressed-hispid; leaf-blades oblong to linear or lanceolate, ½ to 1½ inches long, thickly white-dotted with pustules at the base of the bristles; spikes with minute scattered bracts, openly paniculate, ½ to 1½ inches long, the flowers at length discrete; calyx-lobes lanceolate, ¾ (in fruit 1¼) lines long, thickly set with short ascending bristles; corolla 1¼ lines wide; nutlets 4, equal, truncate at base, ¾ line long, white-papillate upon a brownish ground and wing-margined, the wing entire and slightly turned outward, same color as body and ¼ to ⅓ as wide as the body; dorsal side of the nutlets a little flattish, the ventral side convexly 2-planed, the ventral groove widened downwards from about the middle.

Gravelly or rocky ground, 50 to 3500 feet: eastern Mohave Desert; Colorado Desert. East to Arizona. Apr.

Locs.—Mohave Desert: The Caves, Mohave River sink, *Parish* 9855. Colorado Desert: Four-S ranch, 25 mi. ne. of Ogilby, *Munz & Hitchcock* 12,173; Painted Cañon, Mecca Hills, *Jepson* 11,678; Split Mt. (near Fish Mt.), *T. Brandegee;* Calexico, *Davy* 8007.

Refs.—CRYPTANTHA HOLOPTERA Mcbr., Contrib. Gray Herb. 48:44 (1916); Jepson, Man. 848 (1925). *Eritrichium holopterum* Gray, Proc. Am. Acad. 12:81 (1876), type loc. Ehrenburg, Ariz., *Palmer*. *Krynitzkia holoptera* Gray, l.c. 20:276 (1885). *Oreocarya holoptera* Greene, Pitt. 1:58 (1887).

22. **C. pterocarya** Greene. Stem slender and loosely branched or diffusely much branched from base, 5 to 9 inches high, rather densely leafy at base, less leafy above; herbage hispid with appressed or spreading hairs; leaf-blades linear, ½ to 1 inch long, the basal ones conspicuously tessellate-pustulate; spikes in 2s or 3s, short (¼ to ½ or rarely ¾ inch long), bractless, at first glomerate; calyx-lobes linear, in fruit becoming ovate, densely or thinly soft-hairy and somewhat yellowish, sometimes with a few bristles; corolla ¼ to ½ line broad; fruiting calyx 1 to 2 lines long, the nutlet wings protruded between the lobes so as to give an angular aspect to the distended calyx; nutlets 4, the body lanceolate, papillate on the back, wing-margined, the wings white-chartaceous, as broad as body or somewhat broader, crenate or fimbriate-toothed, especially towards apex (or 1 nutlet wingless and of a different color).

Gravelly slopes of cañons and dry desert mesas, wholly transmontane, 200 to 5700 feet: Colorado and Mohave deserts; southern Sierra Nevada in Kern Co.; Inyo and Lassen Cos. East to Texas, north to Washington. Apr.-June.

Locs.—Colorado Desert: Myers Creek bridge, sw. Imperial Co., *Jepson* 11,785; San Felipe Valley, e. San Diego Co., *Jepson* 17,130; Chuckwalla Bench, *Schellenger;* Cottonwood Spr., Eagle Mts., *Jepson* 12,564. Mohave Desert: Goffs, *Newlon* 536; Barnwell, New York Mts., *Jepson* 5472; Essex, *Jepson* 18,158a; Hole-in-the-Wall, Providence Mts., *Jepson* 18,321; Willow Sprs. (cove below), Old Dad Mts., *Jepson* 20,404; Newberry (lava sw.), *Newlon* 509; Ord Mt., *Jepson* 15,487; Granite Mts., (s. of Avawatz Mts.), *Jepson* 17,305; Paradise Mts., (4½ mi. ne.), *Jepson* 20,326; Barstow, *Jepson* 20,362; Kramer, *Jepson* 5518; Rock Creek, n. slope San Gabriel Mts., *Peirson* 477; Red Rock Cañon, e. end El Paso Mts., *Allison Krames*. Southern Sierra Nevada in Kern Co.: Kernville, *T. Brandegee*. Inyo Co.: Johnson Cañon, Panamint Range, *Jepson* 19,601; Hanaupah Cañon, Panamint Range, *Jepson* 6985; Argus Range (n. end), *Jepson* 19,559; Centennial Flat, *Renner* 39; Hole-in-the-Rock Spr., Daylight Pass, Grapevine Mts., *Jepson* 19,809; Alabama Hills, *Renner* 60; Black Cañon, White Mts., *Duran* 574. Lassen Co.: Honey Lake, *T. Brandegee*.

Refs.—CRYPTANTHA PTEROCARYA Greene, Pitt. 1:120 (1887); Jepson, Man. 849 (1925). *Eritrichium pterocaryum* Torr., Bot. Mex. Bound. 142 (1859).—In this work Torrey is for the first time publishing the name, Eritrichium pterocaryum, not as originally new in this publication, but new as derived from a manuscript later issued as his Phanerogamia of the Pacific Coast, Wilkes Exped. 415, pl. 13 (1874), this name being first based on a collection made at Walla Walla, Wash. (*Pickering & Breckenridge*), which locality may, therefore, be regarded as the type locality. *Krynitzkia pterocarya* Gray, Proc. Am. Acad. 20:276 (1885). *Eritrichium pterocaryum* var. *pectinatum* Gray, l.c. 10:61 (1874), type loc. s. Utah, *Parry*. *Krynitzkia pterocarya* var. *pectinata* Gray, l.c. *K. cycloptera* Greene, Bull. Cal. Acad. 1:207 (1885), type loc. Tucson, Ariz., *Pringle*. *C. cycloptera* Greene, Pitt. 1:120 (1887). *C. pterocarya* var. *cycloptera* Mcbr., Contrib. Gray Herb. 48:44 (1916). *C. pterocarya* var. *purpusii* Jepson, Man. 849 (1925), type loc. Argus Mts., Inyo Co., *Purpus* 5433.

23. **C. oxygona** Greene. Stem slender, branching, 5 to 14 inches high; herbage ascending-hispid; leaf-blades long-linear, ½ to 1¼ inches long; spikes short, geminate, ternate or paniculate, in fruit becoming a little loose; calyx-lobes densely silky-hirsute and short-bristly; corolla (1½ or) 2 to 3 lines broad; fruiting calyx 1½ lines long, slightly exceeding nutlets; nutlets 4, the body ovate, short-attenuate, thickly papillate, 1 line long; 3 of the nutlets bordered by a membranous erose wing ¼ to ⅓ as broad as the body, the fourth nutlet wingless or nearly so; ventral groove closed or slightly open, forked at base; style about equaling nutlets.

Gravelly washes or rich flats, 300 to 5000 feet: inner South Coast Range and the bordering San Joaquin Valley plain; Tehachapi Mts.; Sierra Nevada from Madera Co. to Kern Co.; Mono Co.; northern Mohave Desert; San Gabriel Mts.; Santa Rosa Mts. East to Nevada. Mar.-May.

Locs.—Inner South Coast Range (on east slope) and its bordering San Joaquin Valley plain: Ortigalita Valley (bordering hills), w. Merced Co., *Hoover* 4370; Arroyo Hondo wash, w. Fresno Co., *Hoover* 1876; Alcalde, sw. Fresno Co., *T. Brandegee;* McKittrick, Kern Co., *Heller*

7789. Sierra Nevada: near Minarets, Madera Co., *Congdon;* Erskine Creek, Kern Co., *Purpus* 5369. Tehachapi Mts.: Tehachapi Pass, *K. Brandegee.* Mono Co.: Watterson Mdw., *Renner* 5. Northern Mohave Desert: Red Rock Cañon, El Paso Mts., *Allison Krames.* San Gabriel Mts.: betw. Pine Flats and Chilao, *Peirson* 2463. Santa Rosa Mts.: Vandeventer Flat, *Hall* 1161; Coyote Cañon, *Hall* 2849.

Refs.—CRYPTANTHA OXYGONA Greene, Pitt. 1:120 (1887). *Eritrichium oxygonum* Gray, Proc. Am. Acad. 19:89 (1883), type loc. "hills bordering Mohave Desert," *Pringle. Krynitzkia oxygona* Gray, l.c. 20:277 (1885).

24. **C. gracilis** Osterh. Stem branched from the base, 3 to 11 inches high, the branchlets ending in bractless spikes; herbage spreading-hispid; leaf-blades narrowly linear, 4 to 10 lines long, sessile or subsessile, the hairs pustulate-dilated at base; spikes very dense and remaining dense, short (2 to 7 lines long), borne in clusters of 2 to 4 on slender or filiform peduncles; calyx 1 line long, its lobes linear-filiform, black-tipped, densely tufted with erect soft hairs (especially below) and furnished with 1 or 2 or several very slender long bristles set at or near the apex; corolla minute (¼ to ½ line broad), the limb very definitely elevated above the contracted mouth of the relatively large calyx; nutlet 1, ovate-acuminate, smooth, ½ to ⅔ line long, flattish dorsally or a little curved from base to apex, the lateral angles definite and sometimes a little sharp, the ventral side convexly 2-planed, the nutlet thus nearly 3-sided like a buckwheat grain; basal areola small; style ¾ as long as nutlet.

Desert hillslopes and flats, 3000 and 5700 feet: eastern Mohave Desert; Inyo Co. East to Colorado. May.

Locs.—Eastern Mohave Desert: Fountain Cañon, Providence Mts., *Jepson* 18,192; Gilroy Cañon, Providence Mts., *Jepson* 18,233; Barnwell, New York Mts., *K. Brandegee.* Inyo Co.: Black Cañon, White Mts., *Duran.*

Refs.—CRYPTANTHA GRACILIS Osterhout, Bull. Torr. Club 30:236 (1903), type loc. Glenwood Sprs., Garfield Co., Colo., *Osterhout* 2589. *C. hillmanii* Nels. & Ken., Proc. Biol. Soc. Wash. 19:157 (1906), type loc. Huffaker ranch near Reno, Nev., *Hillman. C. gracilis* var. *hillmanii* M. & J., Bull. Torr. Club 49:39 (1922).

25. **C. microstachys** Greene. Stem rigidly erect, branched from the base or above, greenish or sometimes dark reddish, slender, 3 to 12 (or 18) inches high; herbage spreading-hirsute throughout; leaf-blades linear or linear-lanceolate, ½ to 2 inches long; spikes very slender, generally ternate, at length elongated (1 to 3¼ inches long) and flexuous or a little curved, the flowers discrete; calyx-lobes linear-attenuate above the lanceolate base, finely short-hairy and bristly, the 3 outer lobes densely, divergently and unequally long-bristly, usually on lower half, the longer bristles often longer than the lobes; fruiting calyx ascending, ½ to 1 line long; corolla ¼ to 1½ lines broad; nutlet 1, lanceolate or ovate-attenuate or -rostellate, smooth and polished, rounded dorsally and ventrally (that is, circular in cross-section) or the ventral side slightly 2-planed, the groove mainly closed.

Slopes and cañons in the foothills, often in open woods or in chaparral, especially characteristic of the Adenostoma formation, 50 to 3000 feet: inner and middle Coast Ranges from Glenn Co. to San Luis Obispo Co.; Sierra Nevada in Kern Co.; cismontane Southern California. Apr.-June.

Locs.—Coast Ranges: Alder Sprs. (9 mi. e.), Glenn Co., *Heller* 11,444; Epperson road sta., sw. Colusa Co., *K. Brandegee;* Rumsey (4 mi. n.), Yolo Co., *Hoover* 3190; Bell Cañon, Howell Mt., Napa Range, *Jepson* 18,868; Dutton Cañon, Vaca Mts., *Jepson* 21,124; Antioch, *K. Brandegee;* Oyster Ridge, Mt. Diablo, *Bowerman* 2183; Soquel Cañon, Santa Cruz Mts., *Jepson* 21,123; Estrella, San Luis Obispo Co., *Jared.* Sierra Nevada in Kern Co.: Bald Mt., Greenhorn Mts., *C. N. Smith* 200. Cismontane S. Cal.: North Fork Seymour Creek, Mt. Piños, *Peirson* 3234; Painted Cave ranch, Santa Ynez Mts., *Eastwood;* Topanga Cañon, Santa Monica Mts., *Barber;* Rubio Cañon (foothills e.), San Gabriel Mts., *Peirson* 172; San Bernardino, *Parish* 3645; San Jacinto River cañon, *Jepson* 1281; Campo (10 mi. w.), San Diego Co., *Munz & Johnston* 12,628.

Refs.—CRYPTANTHA MICROSTACHYS Greene, Pitt. 1:116 (1887). *Krynitzkia microstachys* Greene; Gray, Proc. Am. Acad. 20:269 (1885), type loc. Fort Tejon, Kern Co., *Xantus* 84.

26. **C. hispidula** Greene. Stem erect, slender, widely branching above the base, 5 to 15 inches high; herbage spreading-hispid; leaf-blades linear, 4 to 9 lines

long; spikes ternate or geminate, soon loose, ½ to 3 inches long; calyx 1 to 1¼ lines long, its lobes linear, densely short-hispid with spreading hairs, the lower part of the outer lobes tufted with a row of deflexed or spreading bristles; corolla 1 to 1½ lines broad; nutlet 1, smooth, polished, ovate or lanceolate but narrowed into a slender beak, almost circular in cross-section (high-rounded on back, rounded on face), the ventral groove shortly forked at base; style shorter than nutlet.

Rocky slopes, 1000 to 3000 feet: Lake Co. to Napa Co. Apr.-June.

Geog. note.—Cryptantha hispidula is restricted to areas of serpentine in Lake County and Napa County. The following stations may be cited: ridge e. of Indian Valley, ne. Lake Co., *Hoover* 3583; near Cobb Valley, sw. Lake Co., *T. Walker;* Snell Valley, n. Napa Co., *Jepson* 18,825; Limekiln Creek, n. of Pope Valley, Napa Co., *Jepson* 18,812; Moore's Creek, Howell Mt., Napa Co., *Tracy* 1575; betw. Monticello and Pope Valley, *M. S. Baker.* Although very close to Cryptantha clevelandii morphologically, Cryptantha hispidula is geographically segregated from that species and in addition occupies a different sort of habitat. The differences between the two units, as here accepted, are difficult to express in precisely differentiating terms. Cryptantha hispidula has very slender stems, Cryptantha clevelandii rather stoutish ones. The nutlet of Cryptantha hispidula is very thick and rounded and markedly and rather abruptly slender beaked. The nutlet of Cryptantha clevelandii is low-rounded on the back, usually a little flattish on the face, that is, it is slightly compressed, and is lanceolate, sometimes with attenuate apex, rarely beaked (Santa Cruz Isl., *Sexauer*). The calyx in Cryptantha hispidula is densely short-hispid with spreading hairs, the midrib of the lobes armed with a row of bristles mostly on lower part, the bristles spreading or sometimes markedly deflexed. The calyx in Cryptantha clevelandii is clothed with ascending hairs and throughout with divergently spreading long bristles. The differences between these two, as indicated, may not be strong enough to sustain Cryptantha hispidula as a sound species, but although the characters for Cryptantha clevelandii are notably variable, the characters as drawn for Cryptantha hispidula are constant and uniform in all collections made in the various parts of its area.

Refs.—CRYPTANTHA HISPIDULA Greene; Baker, West. Am. Plants 2:10 (1903), nomen nudum; Brand in Engler, Pflzr. 4^{252}:60 (1931), type loc. Knoxville, ne. Napa Co., *C. F. Baker* 2966.

27. **C. clevelandii** Greene. Stems branching from the base or subsimple, slender, 3 to 18 inches high; herbage appressed- or spreading-hispid; leaf-blades linear to oblong, ¼ to ½ or 1 inch long; spikes geminate or ternate or paniculate, ½ to 1½ inches long, dense or at length loose; calyx 1 to 1½ lines long; calyx-lobes linear, hirsute-appressed and markedly spreading-bristly throughout; corolla ¼ to 1¼ lines broad; nutlets 1 to 4, lanceolate, attenuate or acuminate, smooth and polished, rounded dorsally, convexly 2-planed ventrally or flattish; groove closed, the basal areola small, open; style ⅔ as long as nutlets, or equaling or slightly surpassing them.

Rocky or sandy hillslopes, especially luxuriant on "burns" in the chaparral, 5 to 2500 feet: South Coast Ranges from Stanislaus Co. to San Luis Obispo Co.; coastal Southern California. South to Lower California. Mar.-May (or Aug.).

Geog. note.—In the South Coast Ranges, Cryptantha clevelandii extends toward the coast but is also found in the inner ranges. At the southern extremity of its distribution, it is strictly coastal; there it replaces the more northern Cryptantha leiocarpa, from which it is scarcely distinguishable.

Locs.—South Coast Ranges: Puerto Cañon, w. Stanislaus Co., *Hoover* 4337; betw. Scott Valley and Felton, Santa Cruz Mts., *Yates* 5254; Big Sur River (coast cliffs s.), *Hoover* 2678; Jolon grade near King City, *K. Brandegee;* San Luis Obispo, *Condit;* Annette (2 mi. ne.), inner South Coast Range, w. Kern Co., *Wiggins* 7977. Tehachapi Mts.: Tehachapi, *K. Brandegee.* Cismontane S. Cal.: Bicknell sta., nw. Santa Barbara Co., *Jepson* 12,678; Purisima Hills, near Lompoc, *Jepson* 11,954; Santa Cruz Isl., *Frida Sexauer;* Hueneme, Ventura Co., *Peirson* 5774; Santa Catalina Isl., *Fosberg* 10,647; Santa Monica Cañon, Santa Monica Mts., *Barber* 116; San Diego, *Greene.*

In the form called Cryptantha hispidissima Greene, the style equals the nutlets or slightly surpasses them, whereas in Cryptantha clevelandii the style is ⅔ as long as the nutlets. This distinction does not, however, seem to segregate material into two groups that are in any wise significant, and the former binomial is, therefore, reduced to synonymy. When Cryptantha clevelandii exhibits large corollas (2 to 2½ lines wide) it is var. FLOROSA Jtn., ranging from San Luis Obispo Co. (Arroyo Grande, *Jepson* 20,263) and Santa Barbara Co. (Purisima Hills, *Jepson* 11,923) south to San Diego.

Var. **dissita** (Jtn.) Jepson & Hoover comb. n. Stem stoutish, branching; calyx 3 to 3¼ lines long; corolla 3 lines broad; nutlets 1 to 3, ovate, attenuate or subrostrate; style slightly exceeding nutlets.—Chaparral hills, 1300 to 1500 feet: western Lake Co. (Scott Valley, *Tracy* 1744).

Refs.—CRYPTANTHA CLEVELANDII Greene, Pitt. 1:117 (1887), type loc. San Diego, *Cleveland & Greene*. *C. rattani* Greene, Pitt. 1:160 (1888), type loc. San Jose, *Rattan*. *C. abramsii* Jtn., Contrib. Gray Herb. 68:52 (1923), type loc. San Pedro Hills near Malaga Cove, Los Angeles Co., *Abrams* 3139. *C. hispidula* var. *abramsii* Brand; Engler, Pflzr. 4^{252}:60 (1931). *C. brandegei* Jtn., l.c. 68:53, type loc. Santa Rosa Isl., *T. Brandegee*. *C. hispidissima* Greene, Pitt. 1:118 (1887), type loc. San Luis Obispo Co., *Lemmon*. *C. leiocarpa* var. *hispidissima* Mcbr., Contrib. Gray Herb. 48:43 (1916). *C. clevelandii* var. *hispidissima* Jtn.; Munz, Man. 427 (1935). Var. FLOROSA Jtn., Contrib. Gray Herb. 74:95 (1925), type loc. Linda Vista, San Diego Co., *Macbride & Payson* 797. Var. DISSITA Jepson & Hoover. *C. dissita* Jtn., Jour. Arn. Arb. 20:383 (1939), type loc. "near foot of grade w. of Lakeport," Lake Co. (i.e., probably near Highland Sprs.), *M. S. Baker* 8956.

28. **C. leiocarpa** Greene. Stem commonly branched from the base, 5 to 18 inches high, the branches many, ending in a short spike or in a dense glomerule of spikes; herbage hispid with spreading hairs, often densely so; leaf-blades linear, ½ to 1 or 1¾ inches long; spikes leafy-bracted at base, rarely bractless, mostly short and glomerate, ¼ to ½ inch long; calyx-lobes linear or linear-lanceolate, sometimes oblong, dark green, ascending-hirsute and spreading-bristly, 2 to 3 lines long; corolla ⅓ to 1½ lines wide; nutlets usually 4, rarely 1, narrowly ovate or lanceolate-rostellate, smooth, rounded dorsally, flattish ventrally, the lateral angles marked by a somewhat definite line but essentially obtuse, the ventral groove minutely forked at base or the fork obsolete.

Sand dunes, sandy flats or grassy headlands, 5 to 500 feet: along the coast line from Los Angeles Co. to Humboldt Co. North to southern Oregon. Apr.-June.

Geog. note.—On morphological grounds Cryptantha leiocarpa is weakly and inconstantly distinguishable from C. clevelandii. By restricting, as is here done, citations of stations to the coast line, the practical effect of morphological weakness is thereby lessened. It is hoped, then, this device may aid, negatively or positively, further inquiry: Playa del Rey, Los Angeles Co., *Parish* 11,864; Santa Rosa Isl., *T. Brandegee;* Point Piños, Monterey Co., *K. Brandegee;* Presidio, San Francisco, *Jepson* 21,129; Pt. Reyes, Marin Co., *Curran;* Bodega Head, Sonoma Co., *K. Brandegee;* Cape Mendocino, *Tracy* 9939 (nutlets convexly 2-planed on face).

Refs.—CRYPTANTHA LEIOCARPA Greene, Pitt. 1:117 (1887); Jepson, Fl. W. Mid. Cal. 445 (1901), ed. 2, 348 (1911), Man. 850 (1925). *Echinospermum leiocarpum* F. & M., Ind. Sem. Hort. Petrop. 2:36 (1836), type loc. Ft. Ross, Sonoma coast; Linnaea 11: Litt.-Ber. 104 (1837); Erythea 2:140 (1894). *Krynitzkia leiocarpa* F. & M., l.c. 7:52 (1841). *Eritrichium leiocarpum* Wats., Bot. King 244 (1871). (?) *C. leiocarpa* var. *eremocaryoides* Brand; Engler, Pflzr. 4^{252}:53 (1931), type loc. Monterey, *J. Ball*.

29. **C. ganderi** Jtn. Bushy-branching plant 4 to 15 inches high; herbage spreading-hispid; leaf-blades linear or linear-lanceolate, mostly sessile, ¾ to 1 inch long; spikes mostly solitary, loose, 3 to 5 inches long; calyx 4 lines long, tufted on lower half with long divergent bristles, the lobes linear-filiform, densely ascending-hirsute on lower half inside; corolla minute (½ line wide); nutlet 1, smooth, ovate-rostrate, low-rounded or flattish dorsally, flattish ventrally, the lateral angles obtuse, the ventral groove widely forked at the sub-truncatish base of nutlet.

Desert valleys, 700 to 1100 feet: Borrego Valley, northeastern San Diego Co., Colorado Desert. South to Lower California and Sonora (Jour. Arn. Arb. 20: 386). Apr.

Tax. note.—In all its single features Cryptantha ganderi resembles closely various California species of Cryptantha. In the sum total of its characters, however, it seems an unusual plant and would be expected to have that which it apparently does not have, a distinctive or unique feature of a kind which in many cases characterizes other southwestern species of this genus. Dorsally, the nutlets bear a few widely scattered microscopic muriculations or needle-like points—but these represent very obscure and inconsiderable structures.

Ref.—CRYPTANTHA GANDERI Jtn., Jour. Arn. Arb. 20:386 (1939), type loc. Borrego Valley, San Diego Co., *Gander* 5328 (merotyp. vidi).

30. **C. maritima** Greene. Stem usually stout with many ascending branches, 5 to 11 inches high; herbage rufescent, hispid, often also appressed-hirsute; leaves linear, somewhat thickened, ½ to 1 inch long; spikes densely flowered, elongate in age, freely bracteate, the bracts linear, 1 to 3 lines long; calyx-lobes linear-oblong to filiform, 1 line long, spreading-bristly (some bristles as long as the lobes) and

densely tufted with soft hairs (the hairs ascending and subequal) or the tufts often early deciduous; corolla ¼ line broad; nutlet solitary or usually so, ovate-attenuate, smooth, brown, rounded dorsally, a little rounded or convexly 2-planed ventrally, the angles sharply defined and subacute, the groove closed.

Gravelly washes, sandy flats in cañon-bottoms, and coastal mesas, 100 to 3500 feet: Inyo Co.; eastern Mohave Desert; western Colorado Desert; San Diego coast; Santa Barbara Isls. Mar.-May.

Locs.—Inyo Co.: Inyo, *T. Brandegee;* Furnace Creek, Funeral Mts., *Parish.* Eastern Mohave Desert: Needles (11 mi. w.), *Munz & Harwood* 3611. Western Colorado Desert: Painted Cañon, Mecca Hills, *Jepson* 11,635; Coachella (wash e.), *Schellenger* 25s; Bailey Well, w. Imperial Co., *Jepson* 17,093; Vallecito, e. San Diego Co., *Jepson* 8563; Split Mt. (near Fish Mt.), *Parish* 1922. Santa Barbara Isls.: Santa Barbara Isl., *Trask;* Santa Catalina Isl., *T. Brandegee;* San Nicolas Isl., *Trask* 56; San Clemente Isl., *Murbarger* 186. San Diego coast: Pt. Loma, *Orcutt.*

Var. **pilosa** Jtn. Calyx densely tufted with soft ascending hairs, the tips of the lobes with a few divergent long bristles.—Inyo Co.; eastern Mohave Desert; Colorado Desert. East to Nevada and Arizona, south to Lower California. It is often associated with the species but has a markedly distinctive appearance. The ventral face of the nutlets is sometimes flattish and the lateral angles sometimes obtuse.

Locs.—Inyo Co.: Hole-in-the-Rock Spr., Daylight Pass, Grapevine Mts., *Jepson* 19,808; Argus Range (n. end), *Jepson* 19,553. Mohave Desert: Needles, *Lemmon;* Amboy Crater, *Jepson* 20,304; Kane Spr., Ord Mt., *Hall & Chandler* 6807; Calico, *Parish* 9798. Colorado Desert: Painted Cañon, Mecca Hills, *Jepson* 11,635a; Coachella (wash e.), *Schellenger* 25t; Signal Mt., *T. Brandegee.*

Refs.—CRYPTANTHA MARITIMA Greene, Pitt. 1:117 (1887); M. & J., Bull. Torr. Club 49:38 (1922). *Krynitzkia maritima* Greene, Bull. Cal. Acad. 1:204 (1885), type loc. Guadalupe Isl., L. Cal., *Palmer, Greene. K. ramosissima* Greene, l.c. 1:203 (Aug., 1885); not Gray (Jan., 1885). *C. ramosissima* Greene, Pitt. 1:116 (1887); Jepson, Man. 847 (1925). Var. PILOSA Jtn., Univ. Cal. Publ. Bot. 7:445 (1922), type loc. Los Angeles Bay, L. Cal., *Palmer* 551.

31. **C. mohavensis** Greene. Stem branching low, forming a bushy plant 4 to 13 inches high; herbage spreading-hispid; leaf-blades linear, ¼ to 1½ inches long; spikes ¼ to 1½ inches long, borne in terminal glomerules or in terminal loose clusters; calyx-lobes linear, ascending-hirsute and sparingly spreading-bristly; corolla 1½ to 2¼ lines broad; nutlets 4, ovate-acute, truncate at base, smooth, polished, flattish or subflattish dorsally, somewhat flattish on the ventral side or convexly 2-planed, the lateral angles obtuse.

Sandy flats, 2000 to 6000 feet: mesa borders of the Tehachapi Mts. or in their lower cañons; southern Sierra Nevada in Tulare and Inyo Cos. East to Nevada. May.

Locs.—Tehachapi Mts.: betw. Mohave sta. (Mohave Desert) and Cameron sta. (lower Tehachapi Pass), *K. Brandegee;* Bena sta. (near Caliente), *Heller* 7642. Inyo Co.: Grays, South Fork Oak Creek, *S. W. Austin* 629; Andrews Camp, Bishop Creek, *K. Brandegee.*

Refs.—CRYPTANTHA MOHAVENSIS Greene, Pitt. 1:120 (1887). *Krynitzkia mohavensis* Greene, Bull. Cal. Acad. 1:207 (1885), type loc. "Mohave Desert," *Curran* (that is, region of Mohave sta., most probably in the lower Tehachapi Pass). *C. fallax* Greene, Pitt. 5:54 (1902), type loc. Tehachapi, *Greene. C. incana* Greene, Lflts. 1:79 (1904), type loc. Nine-Mile Creek, Tulare Co., *Culbertson* 4537 (seems to belong here.—R. F. Hoover). *C. torreyana* var. *incana* Jepson, Man. 850 (1925).

32. **C. torreyana** Greene. Stem erect, usually stout, branched from the middle or the base, 7 to 21 inches high; herbage spreading rough-hispid; leaf-blades linear, 1½ to 2¼ inches long; spikes in 1s, 2s or 3s, ¼ to 1 inch long and dense, or sometimes elongated and loose (2 to 3 inches long); calyx-lobes narrowly linear, spreading-bristly and ascending-hirsute; corolla minute (¼ to ½ line broad); fruiting calyx much exceeding fruit, 2 to 4 lines long, a little constricted at summit of nutlets, the tips of the lobes spreading; nutlets 4, ovate, acute, smooth, a little flattish on back, convexly 2-planed ventrally, the lateral angles obtuse, the groove and its short basal fork closed.

Grassy open or half-shady or brushy hillslopes, 1500 to 6600 (7300) feet: North Coast Ranges from Sonoma Co. to western Siskiyou Co.; west slope Sierra Nevada from Kern Co. to eastern Siskiyou Co.; east side Sierra Nevada from Mono Co. to Modoc Co. East to Utah and Wyoming, north to British Columbia. May-June.

Locs.—Coast Ranges: Santa Rosa Creek cañon, Sonoma Co., *M. S. Baker* 620; South Mill Creek (head), se. of Ukiah, *Jepson* 9234; Eden Valley, se. Mendocino Co., *Jepson* 21,122; Long Valley, cent. Mendocino Co., *Tracy* 5806; South Yollo Bolly, se. Trinity Co., *Jepson* 21,134; Chamise Mt., near Shelter Cove, ne. Mendocino Co., *Tracy* 6320; betw. Three Creeks and Willow Creek, n. Humboldt Co., *Tracy* 5841; Three Forks of Mad River, Trinity Co., *Tracy* 10,206; Beegum, w. Tehama Co., *Jepson* 16,631; Sisson, w. Siskiyou Co., *Jepson* 21,131. Sierra Nevada: Poso Creek, Greenhorn Mts., *Hall & Babcock;* betw. Watson Spr. and Cedar Creek, North Fork Kaweah River, *Jepson* 598; Chowchilla School, Mariposa Co., *Jepson* 12,802; Deadman Creek, Middle Fork Stanislaus River, *Jepson* 6560a; near Alpine Camp, upper Truckee River, Eldorado Co., *H. M. Wheeler;* Bear Valley, near Emigrant Gap, *Jepson* 21,133; Yuba Pass, Sierra Co., *Jepson* 16,855; Rock Creek, Meadow Valley, Plumas Co., *Jepson* 19,337; Rich Gulch, Plumas Co., *Follett* 99; Shasta Retreat, Siskiyou Co., *Condit.* East side of Sierra Nevada: Walker River, Mono Co., *Munz* 7571; Dog Valley, e. Nevada Co., *Jepson* 21,132; North Fork Bidwell Creek, n. Warner Mts., *Jepson* 7907.

Var. **pumila** Jtn. Plants often dwarfish and 2 to 5 inches high; fruiting calyx 1¼ lines long; nutlets smaller.—South Coast Ranges (Los Gatos, foothills w., *Heller* 7458; Penitencia Creek, near Mt. Hamilton foothills, *Rattan;* Mt. Diablo, *Bowerman* 2245; Strawberry Cañon, Berkeley Hills, *Tracy* 793); Marin Co. (Mt. Tamalpais).

Var. **scrutata** Jepson nom. n. Stem erect, weak, 7 to 16 inches high, divergently few-branched, the branches long, slender, flexuous; calyx 1½ lines long, densely ascending-hispid with short hairs, the midrib of the lobes with a few much reduced bristles, these bristles very slender and spreading, sometimes long, sometimes very short, but rising above the appressed hairs at an angle; corolla 1 to 1½ lines wide.—Chaparral slopes, open woods and rocky outcrops, 500 to 3000 feet: North Coast Ranges from Lake Co. to Del Norte Co. Apr.-June.

Tax. note.—The nutlets of var. scrutata are like those of the species, Cryptantha torreyana. For example, in representative collections, the nutlets of var. scrutata in a collection from the hills near the mouth of the South Fork Trinity (*Tracy* 10,141) are identical with the nutlets in a collection of Cryptantha torreyana from Chamise Mt., near Shelter Cove, *Tracy* 6320; the nutlets of these two collections are alike in shape, in beak, in the flattened back, in the slightly raised ventral side, in the groove and its fork. The two forms are alike in all other features save differences in habit and save that the calyx-bristles are extremely reduced in number and in size in the variety. Other stations for the variety may be cited as follows: Ruth (6 miles above), Mad River Valley, Trinity Co., *Tracy* 4298; New River Bluffs, Trinity Co., *Tracy* 6388; Smith River, Del Norte Co., *Parks* 24,011 (det. R. F. Hoover).

Var. **traskae** (Jtn.) Jepson comb. n. Nutlets smaller than in the species, ¾ as long, smooth but minutely tuberculate towards apex dorsally.—San Nicolas Isl.; San Clemente Isl., *Munz* 6674. The nutlets in the type of this variety in shape, basal fork of groove and somewhat truncatish base resemble closely the nutlets of the species, Cryptantha torreyana. Although the variety is, admittedly, widely sundered geographically from the species, it cannot well be referred to the more nearly contiguous species, Cryptantha clevelandii, which differs in fundamental structure on account of its narrow thickened or subteretish rostellate nutlets as opposed to the somewhat compressed broad nutlets of var. traskae.

Refs.—CRYPTANTHA TORREYANA Greene, Pitt. 1:118 (1887); Jepson, Fl. W. Mid. Cal. 446 (1901), ed. 2, 348 (1911), Man. 850 (1925). *Krynitzkia torreyana* Gray, Proc. Am. Acad. 20:271 (1885), "nearly throughout Cal."; (lectotype, Yosemite Valley, *Torrey* in 1865; cf. Johnston, Contrib. Gray. Herb. 74:81). *K. torreyana* var. *calycosa* Gray, l.c., type loc. Lake Co., *Rattan* (no. 42, acc. Gray Herb.), the flowers capitate-congested at ends of branches, the calyces 3 lines long. *C. torreyana* subvar. *capitata* Brand; Engler, Pflzr. 4^{252}:58 (1931), type loc. Lake Co., *Rattan* 42. *C. torreyana* var. *calistogae* Jtn., Contrib. Gray Herb. 74:80 (1925), type loc. Calistoga, *Tracy* 2094, a form with longer style. *C. trifurca* Eastw., Bull. Torr. Club 32:203 (1905), type loc. Klamathon, Siskiyou Co., *Copeland* 3550. Var. PUMILA Jtn., Contrib. Gray Herb. 74:80 (1925). *C. pumila* Hel., Muhl. 2:242 (1906), type loc. summit Mt. Tamalpais, Marin Co., *Heller* 8403. Var. SCRUTATA Jepson. *C. milobakeri* Jtn., Jour. Arn. Arb. 21:63 (1940), type loc. betw. Kelseyville and Lower Lake, Lake Co., *M. S. Baker* 7629 (typ. non vidi). Var. TRASKAE (Jtn.) Jepson. *C. traskae* Jtn., Contrib. Gray Herb. 74:77 (1925), type loc. San Nicolas Isl., *Trask.*

33. **C. watsonii** Greene. Stem erect, branched, 4 to 10 inches high; herbage hirsute; leaf-blades narrowly oblong or linear, ½ to 1½ inches long; spikes 2 to 9 lines long; calyx-lobes lanceolate, thinly strigose and sparsely spreading-bristly; corolla ½ to ¾ line broad; nutlets 4 or 3, smooth, narrow-ovate, flattish on back, convexly 2-planed on the ventral side, the lateral angles sharply acute, the ventral groove closed or nearly so, shortly forked at base.

Desert ranges, 5000 to 10,300 feet: White Mts. East to Colorado, north to Oregon and Montana. May-Aug.

Geog. note.—Distributed widely over the mountains of the Great Basin region, Cryptantha watsonii has never hitherto been reported from California. Three collections are available for record: Big Prospector Mdw., White Mts., *J. Grinnell* in 1917 (det. R. F. Hoover, in 1938); Conway grade, n. of Mono Lake, *Hoover* 5431; Hot Creek, below Fales Hot Sprs., *Hoover* 5446.

Refs.—CRYPTANTHA WATSONII Greene, Pitt. 1:120 (1887). *Krynitzkia watsonii* Gray, Proc. Am. Acad. 20:271 (1885), type loc. Wasatch Mts., Utah, *Watson*.

34. **C. nemaclada** Greene. Stem slender, erect, simple or branching from the base, 6 to 14 inches high; herbage strigose and thinly spreading-bristly; leaves loosely hispid, the blades linear, ½ to 1¼ inches long; spikes geminate or ternate, subfiliform, at length elongated and loose, ½ to 3 inches long; calyx-lobes linear-attenuate, the lower half densely spreading-bristly, the upper part densely clothed with short equal bristles bent slightly below the horizontal or markedly deflexed; corolla ¾ to 1 line broad; nutlets 1 to 4, ovate-lanceolate or ovate-attenuate, whitish, smooth and polished, rounded dorsally, the angles rounded, the ventral face convexly 2-planed, the groove closed; pericarp thin, fragile.

Barren clay banks or shaly outcrops in the hills and valleys, 75 to 3000 feet: Coast Ranges from Colusa Co. to San Luis Obispo Co., mostly in the inner range and sometimes in the bordering valleys; Tehachapi Mts. Apr.-May.

Locs.—North Coast Ranges from Colusa Co. (and its bordering Sacramento plain) to Napa Co.: Colusa jct., *T. Brandegee;* Sand Creek, w. Colusa Co. foothills, *Hoover* 3217; Monticello (w. of), Napa Co., *M. S. Baker*. South Coast Ranges: Puerto Cañon, w. Stanislaus Co., *Hoover* 3362; North Fork Lewis Creek, se. Monterey Co., *Jepson* 2695; Diablo Range, sw. Fresno Co., *Jepson* 15,395; Paso Robles, *K. Brandegee*. Tehachapi Mts.: Keene sta., *K. Brandegee*.

Refs.—CRYPTANTHA NEMACLADA Greene, Pitt. 1:118 (1887), type loc. "Colusa Co.," *Curran*, most probably near the old-time Mountain House (present day Venado), on the 1884 route of the collector.

35. **C. affinis** Greene. Stem slender, erect, branching, 3 to 20 inches high; herbage ascending- or spreading-hispid; leaf-blades oblong to oblanceolate, ½ to 1¾ inches long, those of the main stem often opposite; spikes solitary or geminate or ternate, soon very loose, 1 to 5 inches long, leafy at base; calyx-lobes linear, 1 to 1½ lines long, not elongating in fruit, ascending-hirsute and also spreading-bristly; corolla minute (¼ line broad); nutlets ovate or ovate-lanceolate, acute or acuminate or short-rostellate, smooth, low-rounded on the back, attached only up to the middle of the gynobase, the lateral angles rounded, the ventral groove strongly excentric and closed; basal areola or fork none.

Hillslopes, 3000 to 8000 feet: Cuyamaca and San Bernardino mountains; North Coast Ranges from Lake Co. to western Siskiyou Co.; Sierra Nevada from Tulare Co. to eastern Siskiyou Co. East to Wyoming, north to Washington. June-July.

Locs.—S. Cal.: Cuyamaca Mts., *T. Brandegee;* San Bernardino Mts., *Hall*. North Coast Ranges: Cobb Mt., sw. Lake Co., *C. F. Lummis;* Mt. Sanhedrin, nw. Lake Co., *Heller* 5882; McKay Camp, South Fork Mt., e. Humboldt Co., *Tracy* 8941; Grouse Mt., Humboldt Co., *Tracy* 13,041; Ruth, Mad River Valley, Trinity Co., *Tracy* 8797; Corral Prairie, Trinity Summit, *Tracy* 10,398; Shasta Sprs., *Heller* 7962. Sierra Nevada: Giant Forest, Tulare Co., *K. Brandegee;* Huntington Lake, *A. L. Grant* 1154; Arnold Mdw., Madera Co., *A. L. Grant* 1347; Yosemite, *Jepson* 4277; Strawberry sta., Tuolumne Co., *Jepson* 6500; San Antonio Creek, near Dorrington, Calaveras Co., *Jepson* 10,114; Bear Valley, Nevada Co., *Jepson* 21,135; Prattville, Plumas Co., *T. Brandegee;* Chico Mdws., Butte Co., *Heller* 11,489; Bartle, se. Siskiyou Co., *Jepson* 20,097. East side Sierra Nevada: Mammoth, Mono Co., *K. Brandegee;* Webber Lake (ne. of), Sierra Co., *S. B. Doten*.

Refs.—CRYPTANTHA AFFINIS Greene, Pitt. 1:119 (1887); Jepson, Man. 850 (1925). *Krynitzkia affinis* Gray, Proc. Am. Acad. 20:270 (1885), type loc. "eastern side of the Sierra Nevada" (the phrase first mentioned in the indication of range), with which must be associated the specific locality "Donner Lake, *Torrey*." *C. geminata* Greene, l.c. type loc. Truckee, *Curran*.

36. **C. glomeriflora** Greene. Stem diffusely branching from base or simple and erect, 1 to 5 inches high; herbage ascending-hirsute or the leaves ascending-bristly; leaf-blades linear-oblong, ¼ to ½ inch long; flowers 2, 3 or 4 in very small glomerules (extremely reduced spikes 1 to 1½ lines long), at the ends of the branches, and also in glomerules (or sometimes solitary) in the axils of the leaves, even the lowest; calyx-lobes linear, ½ to ¾ line long, densely strigose and also spreading-bristly, the bristles often as long; corolla very minute (⅛ line broad); nutlet solitary, smooth and shining, ovate, shortly attenuate or rostellate, the ventral groove slightly off center, open only at base.

Montane slopes and meadows, 6000 to 10,650 feet, rare: Sierra Nevada, mostly east side or high easterly meadows, from Nevada Co. to Tulare Co.; Sweetwater and White mountains, Mono Co. July.

Locs.—Sierra Nevada: Truckee, Nevada Co., *Sonne;* Eagle Mdw., Eagle Peak, Tuolumne Co., *Hoover* 1350; Rock Creek Lakes basin, Inyo Co., *Peirson* 11,146; Volcano Creek, Tulare Co., *Hall & Babcock* 5322. Mono Co.: Cottonwood Creek, Sweetwater Mts., *Hoover* 5540; near Big Prospector Mdw., White Mts., *Jepson* 7357.

Refs.—CRYPTANTHA GLOMERIFLORA Greene, Pitt. 1:116 (1887), type loc. Truckee (2 mi. below), *Sonne;* Jepson, Man. 849 (1925).

37. **C. flaccida** Greene. (Fig. 417.) Stem strictly and rigidly erect, with few ascending branches at the top, ¾ to 2 feet high; herbage strigulose; leaf-blades linear, ½ to 1½ inches long; spikes 3 or 4 in a terminal umbellate cluster or panicle, dense or soon loose and 2 to 4 inches long; calyx-lobes narrowly linear, thickish at base and closely erect above, armed on lower part with a dense deflexed or spreading tuft of long curved bristles, the upper part set with short scattered curved bristles, or sometimes 1 or 2 inner calyx-lobes (next to the axis) destitute of long bristles, or all the lobes destitute of long bristles; fruiting calyx 1 to 1½ lines long, appressed to rachis; corolla ½ to 1 (or 2) lines broad; nutlet 1, ovate or lanceolate, rostellate-acuminate, rounded at base, smooth and shining, circular in cross-section or a little flattish ventrally, the groove median or sometimes excentric, closed, areolate at base, the areola small or minute, circular or deltoid.

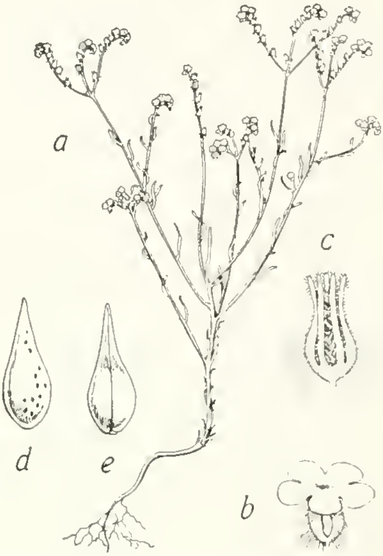

Fig. 417. CRYPTANTHA FLACCIDA Greene. *a*, habit, × ¼; *b*, fl., × 4; *c*, fr. calyx, × 4; *d*, nutlet, dorsal view, × 8; *e*, nutlet, ventral view, × 8.

Open hillslopes, rocky ridges or valley floors, 200 to 4500 feet: throughout the mountains of cismontane Cal., but rare in Southern California; absent from the Great Valley floor or present only rarely on the margins near the foothills; absent from the deserts but occurring occasionally in the intramontane foothills on the desert borders. North to Washington. Apr.-June.

Locs.—S. Cal.: Cuyamaca Mts., *T. Brandegee;* Saugus, *T. Brandegee.* Coast Ranges: Bitterwater Valley, e. San Luis Obispo Co., *Wiggins* 5814; Tulare Hill, Coyote sta., Santa Clara Valley, *Jepson;* Livermore Valley, *Jepson* 21,120; Mt. Diablo, *Bowerman* 269; Tiburon, Marin Co., *Jepson* 19,945; Howell Mt., Napa Range, *Jepson* 2443; Pleasants Valley, nw. Solano Co., *Jepson* 21,137; Blue Lakes, Lake Co., *Jepson* 21,136; Mt. Sanhedrin, e. Mendocino Co., *Jepson* 21,119; Paskenta, sw. Tehama Co., *Virginia Bailey;* Look Prairie, Bull Creek, Humboldt Co., *Constance* 620; Three Forks of Mad River, Trinity Co., *Tracy* 10,195; Yreka, *Butler* 734. Great Valley (margins of, near the foothills): Edison, Kern Co., *Jepson* 18,144; Madera, *Buckminster;* Buckeye Creek, Hershey, Yolo Co., *Jepson* 8957; Marysville Buttes, *Jepson* 21,136; Crane Creek, w. Tehama Co., *Jepson* 21,121; Red Bluff (rubble field 3 mi. ne.), *Jepson* 16,361. Tehachapi Mts.: Caliente, *Jepson* 6754; Keene, *Jepson* 7160. Sierra Nevada: Pine Mt., Greenhorn Mts., Kern Co., *C. N. Smith* 212; betw. Colony Mill and Marble Fork, Tulare Co., *Jepson* 664; Wawona, *A. L. Grant* 1299; Yosemite, *Jepson* 10,468; Mormon Bar, Mariposa Co., *Jepson* 12,769; Chinese Camp, Tuolumne Co., *Jepson* 6323; Parrotts Ferry, Stanislaus River, *A. L. Grant* 74a; Pine Grove, Amador Co., *Hansen* 430; Table Mt., Butte Co., *Heller* 11,325; Ager, Siskiyou Co., *K. Brandegee.*

Refs.—CRYPTANTHA FLACCIDA Greene, Pitt. 1:115 (1887); Jepson, Fl. W. Mid. Cal. 445 (1901), ed. 2, 347 (1911), Man. 850 (1925). *Myosotis flaccida* Dougl.; Lehm., Pugill. 2:22 (1830), type collected by *Douglas,* probably in e. Wash. or Ore. *Eritrichium oxycaryum* Gray, Proc. Am. Acad. 10:58 (1874), "common in Ore. and Cal." *Krynitzkia oxycarya* Gray, l.c. 20:269 (1885). *C. flaccida* var. *maior* Brand; Engler, Pflzr. 4^{252}:61 (1931), type loc. Soledad, Monterey Co., *Congdon* 72. *C. flaccida* var. *minor* Brand, l.c., type loc. Whitman Co., Wash., *Elmer* 766.

38. **C. rostellata** Greene. Stem slender, branching above, 4 to 9 inches high; herbage strigulose; leaves strictly ascending, the lower ones opposite or relatively approximate, the upper alternate; leaf-blades oblanceolate or linear, 3 to 7 lines long; spikes solitary or geminate, the flowers at length moderately discrete; calyx-lobes narrow-linear, appressed short-hirsute and densely short-bristly, the bristles spreading, subequal, curved at tip, or the bristles on lower part of calyx longer and spreading-tufted or deflexed-tufted; corolla $\frac{1}{4}$ to $\frac{3}{4}$ line broad; fruiting calyx $1\frac{1}{4}$ to $1\frac{3}{4}$ lines long; nutlet 1, ovate-lanceolate, acute, truncate at base, smooth and polished, high-rounded on back, the face flattish or low-rounded, the ventral groove forked at base, with a usually open areola.

Dry hills, 200 to 3000 feet: inner North Coast Range, east slope from Colusa Co. to Tehama Co. and the bordering rolling plain; Sierra Nevada foothills from Mariposa Co. to Siskiyou Co. North to Washington. Apr.-May.

Tax. note.—Cryptantha rostellata is closely related to C. flaccida. The lower part of the calyx in Cryptantha rostellata is sometimes tufted with deflexed or spreading bristles or as frequently the bristles may be much reduced. With Cryptantha flaccida, the deflexed bristle tufts on the lower part of calyx are long and very striking, but in some collections they are so reduced as to be subobsolete. As so often, recourse for differentiae must be had by looking to the nutlets. In Cryptantha rostellata the nutlet is quadratish-rostrate, truncate at base, the ventral groove forked at base. In Cryptantha flaccida the nutlet is ovate-rostrate, rounded at base, the ventral groove with a minute areola at base but not forked. Collections of Cryptantha rostellata are few and represent scattered stations. As a species it may not become well stabilized until more ample material is studied.

Locs.—Inner North Coast Range foothills: sw. Colusa Co.; Paskenta, sw. Tehama Co., *Jepson* 16,314; Crane Creek, w. Tehama Co., *Jepson* 21,114. Sierra Nevada foothills: Coulterville, Mariposa Co., *Hoover* 3422; near Chico (probably foothills e.), *Parry;* Hornbrook, Siskiyou Co., *Howell* 1386. When the bristles on lower part of calyx become fewer or subobsolete, then it is var. spithamea (Jtn.) Jepson comb. n., corolla 1 line broad; a precarious variety, since resting mainly on the instability of bristle features. This form belongs in Mariposa Co.

Refs.—CRYPTANTHA ROSTELLATA Greene, Pitt. 1:116 (1897). *Krynitzkia rostellata* Greene, Bull. Cal. Acad. 1:203 (1885), type loc. "Lake and Colusa counties, 1884," *Curran* (that is, on the Lake-Colusa boundary near Leesville, sw. Colusa Co.). Var. SPITHAMEA Jepson. *C. spithamea* Jtn., Jour. Arn. Arb. 20:385 (1939), type loc. Coulterville (3 mi. nw.), Mariposa Co., *Hoover* 2169.

39. **C. sparsiflora** Greene. Stem slender, loosely and widely branching, 5 to 10 inches high, the ultimate peduncular branches filiform, $2\frac{1}{2}$ to 5 inches long, each ending in a single spike; herbage thinly strigose; leaf-blades linear, 5 to 9 lines long; spikes few-flowered, at length loose (the discrete flowers mostly 3 to 7 lines apart); calyx short-bristly, the hairs mostly uncinate; calyx-lobes lanceolate, the 2 or 3 larger ones membranous-margined below; corolla minute ($\frac{1}{4}$ line broad); fruiting calyx 1 line long; nutlet 1, ovate, acute, smooth and polished, the lateral angles acute, the ventral groove closed; pericarp thin and fragile, somewhat bladdery.

Gravelly or rocky slopes, 1000 to 4000 feet: chaparral belt of the ranges surrounding the San Joaquin Valley, that is, in the inner South Coast Range in Stanislaus Co. (east slope of foothills), and in the Sierra Nevada from Mariposa Co. to Kern Co. May.

Locs.—Inner South Coast Range: Puerto Cañon, w. Stanislaus Co., *Hoover* 3370. Southern Sierra Nevada: Mormon Bar, Mariposa Co. (Contrib. Gray Herb. 74:101); Coburn Mill, Fresno Co., *T. Brandegee;* Bear Mt. (n. slope), Tulare Co., *Hoover* 3478; Havilah, Kern Co., *T. Brandegee.*

Refs.—CRYPTANTHA SPARSIFLORA Greene, Pitt. 1:116 (1887). *Krynitzkia sparsiflora* Greene, Bull. Cal. Acad. 1:203 (1885), collected in 1884, *Curran,* "the locality uncertain." In that year M. K. Curran collected on a trip from Arbuckle to Mountain House (Venado) in southwestern Colusa Co., thence to Epperson road station (southwestern Colusa Co.) on east slope of Bear Mt., thence to Hough Springs (northeastern Lake Co.). She also collected that year in the Tehachapi Mts.

14. **EREMOCARYA** Greene

Densely branching annual with almost filiform stems, the leaves mostly in a basal rosette. Root imparting a purple stain. Racemes dense, spike-like, each flower subtended by a leafy bract, the bracts regular and equal. Calyx 5-parted to base. Corolla white. Gynobase columnar, scarcely separable from the equally broad style. Style in fruit dilated, broader than the capitate stigma, persistent. Nutlets 4, uniform.—Species 1. (Greek eremos, desert, and karua, a nutlet.)

1. **E. micrantha** Greene. Stems several from the base, very slender, diffusely and dichotomously much-branched, 2 to 5 inches high, discretely or remotely leafy, the numerous branchlets ending in terminal spikes which are crowded with equal leaves in regular ranks; herbage hispid, the hairs on the stems usually appressed; leaf-blades linear, 1 to 2 lines long, irregularly but thickly pitted; terminal branchlets densely leafy, the flowers borne in the uppermost axils; calyx-lobes oblong, obtuse; corolla white, sometimes pink in age, ¼ to 1 line broad, the throat obscurely appendaged; nutlets slender-ovate, acuminate or lanceolate-acuminate, smooth and polished or minutely papillate, ⅓ to ⅔ line long, the angles rounded; style exceeding nutlets, the exserted portion lanceolate.

Sandy desert flats or washes, or arid interior valleys or mountain slopes, 500 to 6500 (or 7500) feet: Inyo Co.; Mohave and Colorado deserts; intramontane Southern California from the Santa Clara Valley in Los Angeles Co. to the Laguna Mts. in eastern San Diego Co. South to Lower California, east to Texas, north to Nevada and Oregon. Apr.-June.

Field note.—An observation upon this species recorded in the desert is here transcribed: The way lies through heavy sand in the lower part of the floor of Collins Valley, an arm of the Colorado Desert. One of the many features of interest in a wash proves to be a scattered colony of Eremocarya micrantha. The many stems from the root-crown branch dichotomously and repeatedly. Numerous terminal branchlets, crowded with short densely-ranked linear leaves, form a close even weave over the periphery of the plant. In the sandy wash these thickly-branched low rounded borages, diminutive individuals, attract the immediate interest of the desert traveler. Very dark green, and thus in striking contrast to the prevailing grays and browns and slate colors of the dull arid level, they suggest, in a curious way, Baobab trees in miniature. Their aspect is distinctive and quite apart from that of any of the Cryptanthae. The root carries a purple stain.—Jepson Field Book 37:177 (1920), ms.

Locs.—Inyo Co.: Argus Range (n. end), *Jepson* 19,550a; Coso Hot Sprs., Coso Range, *C. N. Smith* 149; Inyokern, *C. N. Smith* 64. Tehachapi Mts.: Liebre Twins, *Gifford* 647. Mohave Desert: cove near Willow Sprs., Old Dad Mts., *Jepson* 20,406; Lavic, *Jepson* 15,465; Searles Lake, near Trona, *Jepson* 7147; Red Rock Cañon, w. end El Paso Mts., *Allison Krames;* Saltdale, *Jepson* 19,504; Barstow, *Jepson* 5428; Shay's Well, *Jepson* 5954; Lancaster, *Davy* 2287. Colorado Desert: McCoy Wash, Palo Verde Valley, *Hall* 5938; Mecca, *Parish* 8464; Collins Valley, ne. San Diego Co., *Jepson* 8831; lower San Felipe Valley, e. San Diego Co., *Jepson* 8733; Vallecito, e. San Diego Co., *Jepson* 8603. Intramontane S. Cal.: Saugus, Santa Clara Valley, *K. Brandegee;* Mt. Wilson, San Gabriel Mts., *Geo. B. Grant;* San Bernardino, *Parish;* Santa Rosa Mts., *Munz* 5839; Laguna Mts., *T. Brandegee.*

Var. **lepida** Mcbr. Stems often stouter and taller, less dichotomous; corolla larger (1½ to 2¼ lines broad), the appendages in the throat less obscure.—Montane slopes and valleys, 4500 to 6800 feet: southern Sierra Nevada from Mono Co. to Tulare Co.; intramontane Southern California from Mt. Piños to eastern San Diego Co. South to Lower California. June-Aug.

Locs.—S. Sierra Nevada: Walker River, Mono Co., *Cleveland;* Lloyd Meadows, Freeman Creek, Kern River, *Jepson* 4888. Intramontane S. Cal.: Mt. Piños, n. Ventura Co., *Hall* 2051; Cajon Pass, *Peirson* 370; Bear Valley, San Bernardino Mts., *Abrams* 2904; Strawberry Valley, Mt. San Jacinto, *Jepson* 1308b; Grapevine Spr., e. of Warner Ranch, e. San Diego Co., *Jepson* 8751; San Felipe Valley, e. San Diego Co., *Jepson* 17,119; betw. Pine Valley and Jacumba, se. San Diego Co., *C. V. Meyer* 428.

Refs.—EREMOCARYA MICRANTHA Greene, Pitt. 1:59 (1887). *Eritrichium micranthum* Torr., Bot. Mex. Bound. 141 (1859), type loc. Frontera, Tex., *Thurber.* *Krynitzkia micrantha* Gray, Proc. Am. Acad. 20:275 (1885). *Cryptantha micrantha* Jtn., Contrib. Gray Herb. 68:56 (1923); Jepson, Man. 847 (1925). *Eremocarya abramsiana* Brand; Engler, Pflzr. 4^{252}:77 (1931), type loc. Bear Valley, *Abrams* 2904. Var. LEPIDA Mcbr., Proc. Am. Acad. 51:545 (1916). *Eritrichium micranthum* var. *lepidum* Gray, Syn. Fl. 2:193 (1878), type from San Diego Co., *Cleveland.* *Krynitzkia micrantha* var. *lepida* Gray, Proc. Am. Acad. 20:275 (1885). *Eremocarya lepida* Greene, Pitt. 1:59 (1887). *Cryptantha micrantha* var. *lepida* Jtn., Contrib. Gray Herb. 68:57 (1923); Jepson, Man. 847 (1925).

15. **ALLOCARYA** Greene

Low herbs (ours annuals save 2 perennials), inhabiting depressions or moist ground, commonly branching from or near the base, the branches mostly simple.

Leaves linear or narrow, entire, the lowest always opposite. Flowers in bractless or bracteate spike-like racemes, the racemes mostly elongated. Pedicels persistent, commonly turbinate-enlarged beneath the flower. Calyx 5-parted, indurated and somewhat accrescent in fruit. Corolla white with yellow throat, salverform with short tube; processes or crests in the throat none or weakly developed. Nutlets ovate-lanceolate, smooth, rugose, tuberculate or sometimes furnished with very small spines or minute barbed bristles or prickly points, keeled ventrally, not keeled on the dorsal side or often keeled partially or completely. Scar set basally or just above the base on the ventral side of the nutlet, concave or sometimes raised slightly above the body of the nutlet.—Species about 40, North and South America and Australia. (Greek, allos, diverse, and karua, nut, "in allusion to the extreme diversity of the species as regards the surface of the nutlets.")

Allocarya vs. Maccoya.—As indicated by A. Brand (Engler, Pflzr. 4^{252}:159), Maccoya F. v. Muell. is a prior name for Allocarya Greene. This priority and the validity of it is considered in detail by I. M. Johnston (Contrib. Arn. Arb. 3:14), but the logic of his position in regard to Allocarya does not permit him to make transference of its species to Maccoya. Nor, for other reasons, does the element of priority compel transference in this work. The genus name Allocarya, in use for over fifty years and accepted as a genus in many of the most important publications in systematic botany, ranging from Engler and Prantl's Die Natürlichen Pflanzenfamilien to at least a dozen of the more important regional and state floras of the western United States, is fully eligible for addition to the Nomina Generica Conservanda list. Means as to the formal legislation will be undertaken.

Technical characters in Allocarya.—The recognition of specific units in Allocarya presents some difficulties because, as often in this family, differentiating characters depend chiefly, at times almost exclusively, on the nutlet, various features of which are extremely variable. A studied and critical segregation of collections into natural groups on the basis of the totality of constant or nearly constant features seems to show that the shape and size of the nutlets, the nature of the keel, the size, shape and position of the scar are the most dependable characters for use in the limitation of species in the genus. The various species are only slightly or scarcely at all differentiated by habit or by the racemes or flowers; but, occasionally, in some limited or varying degree, slight differences in habit and slight features of the racemes or flowers may be associated with particular characters of the nutlets. Sculpturing of the nutlet is well developed in most species but distinctive or markedly distinctive sculpturings peculiar to each species are less common. In consequence, this feature of surface sculpturing, on account of its marked variability, has usually only a secondary value or it may be quite trivial.

In recent decades a number of Allocarya species have been published with coast line habitats or near the coast habitats: Allocarya diffusa Greene at San Francisco, A. areolata Piper at Mendocino on the Mendocino coast, A. scalpta Piper at Alder Point Flat in Humboldt County, A. dispar Piper at Agness on the Oregon coast, and A. reticulata Piper at Holmes Flat on the Humboldt coast—all based mainly or wholly on dorsal sculpturings of the nutlets.

Collections which have been made from narrow colonies at these stations or at various stations along the coast line unquestionably represent at each station a genetically uniform population and demonstrate conclusively that dorsal sculpturing of the nutlets is not significant for use in species differentiation in this coast line assemblage. One collection or even one individual exhibits nutlets with dorsal areas transversely long-rugose, short-rugose, interrupted-rugose, partially or variously areolate, smooth on lower part or not smooth, carinate at apex or not carinate, tuberculate or not tuberculate—these surface sculpturings occurring in varying degree and in unequal and varying combinations. It is plain, as a result of such series of comparisons, that the binomials named above represent one species,—Allocarya californica,—a species quite uniform in all particulars save in one feature and in that feature (nutlet surface sculpturing) consistently variable within rather narrow limits. Moreover, this coast line unit, as thus distinguished, inhabits one distinctive phytogeographic area. Such an analysis of materials is representative of what is necessary throughout Allocarya and may well serve, too, as a prudential guide generally in this family.

In 1920, C. V. Piper published a considerable number of new Allocarya species (Contrib. U. S. Nat. Herb. 22:79–113), a few of which have just been noticed. The exigencies of time permitted only the briefest consideration of these new propositions in connection with preparation of the writer's Manual. Though several of these species were recognized in the Manual, there was generated no feeling of confidence in them but only one of distrust. A few years later, on the basis of much ampler material, opportunity came for a less hurried analysis of various authentic collections used in preparation of this National Herbarium paper and it was clear as a result of study of the variability of the surface sculpturing of the nutlets in narrow colonies of obviously one close population genetically, that Piper's species rested primarily on artificial concepts. By this clarifying accession of knowledge, Allocarya, although still laden with serious difficulties, seemed less like a wide and hopeless maze when once this unstable groundwork of so many presumed new species was exposed.

Throughout this genus and throughout the larger genera of this family, it is necessary ever, then, to be on guard against the use of such technical features as result in setting up artificial entities. The advantages of caution herein may be happily illustrated by the case of a minor variant of Allocarya austinae, a species of the northern Sierra Nevada foothills. This species is endowed with a very remarkable nutlet. The dorsal keels of the nutlet, both the median and the lateral, are armed with stout scattered barbed spines. If, now, a nutlet be stripped of its remarkable armed organs it is still determinable as belonging to Allocarya austinae, for the simple reason that it is so distinctive—the remarkable quadratish shape of the body of the nutlet, its truncatish base, the well-marked thin high dorsal keel, the peculiar obcompressed or somewhat fin-like apical beak, make it unmistakable. Now this nutlet, thus artificially denuded, is exactly matched in nature by a variant of Allocarya austinae recently made known, which has smooth nutlets, that is, spineless nutlets. This form was discovered by R. F. Hoover on the margins of the south limits of the species and named by him var. nuda. Intermediate states between it and the species have been established. Failing such comparative analysis, so striking a technical character as a smooth unarmed nutlet could readily be used as the basis for a species which would be quite artificial.

A. Perennials: herbage with a dense cover of long soft hairs.

- Nutlets gray, the dorsal side coarsely and irregularly rugose, the rugae forming an imperfect reticulation with small or minute areolae, the lateral angles weakly keeled; n. Sierra Nevada (mostly transmontane)........1. *A. mollis.*
- Nutlets brown, the dorsal side rather regularly reticulate, with fine ridges and large areolae, the lateral angles rounded; s. Sonoma Co........2. *A. vestita.*

B. Annuals.

1. Scar lateral on the ventral side and reaching the base of nutlet or sometimes exactly basal, not excavate or not deeply so.

- Keel on ventral side of nutlets lying in a groove.
  - Nutlets smooth and shining, whitish or light-colored; valleys bordering or near Mayacamas Range........3. *A. lithocarya.*
  - Nutlets roughened, drab or brownish; along or near the coast line........4. *A. chorisiana.*
- Keel on ventral side not lying in a groove or indistinctly so.
  - Stems erect or laxly diffuse; calyx symmetrical.
    - Scar of nutlets exactly basal, circular, usually separated from the body of nutlet by a constriction; calyx-tube with 5 ribs.
      - Stems slender; nutlets rugulose dorsally; low places, widely distributed........5. *A. stipitata.*
      - Stems fistulous; nutlets only slightly rugulose dorsally; salt marshes or alkaline flats, Santa Clara Valley........6. *A. glabra.*
    - Scar of nutlets lateral or rarely obliquely basal; calyx-tube not ribbed.
      - Nutlets not bristly or spiny (commonly rugulose or tuberculate or sometimes finely muriculate).
        - Scar of nutlets linear (or lanceolate in no. 9).
          - Stems with spreading hairs; pedicels readily deciduous in age; transmontane deserts........7. *A. cooperi.*
          - Stems strigose or ascending-hirsute or subglabrous; pedicels firmly persistent.
            - Stems diffuse; rugae of nutlets smooth; scar not excavate; cent. and s. Cal........8. *A. undulata.*
            - Stems erect; rugae of nutlets rough; scar slightly excavate; upper Napa Valley........9. *A. stricta.*
        - Scar of nutlets ovate or oblong; calyx-tube not ribbed.
          - Rugae of nutlets smooth.
            - Nutlets ovate, the rugae not crowded, usually forming reticulations; scar lateral; mostly along coast line........10. *A. californica.*
            - Nutlets ovate-lanceolate, the transverse rugae crowded into close wrinkles, not forming reticulations; scar obliquely basal; interior and back of coast line........11. *A. cusickii.*
          - Rugae usually sharp and dentate; scar lateral; mostly interior........12. *A. trachycarpa.*
      - Nutlets minutely or microscopically bristly or scabrous; montane, mostly middle altitudes........13. *A. hispidula.*
  - Stems prostrate or widely diffuse; calyx 5-ribbed on lower part, the lobes in fruit turned to one side.
    - Calyx moderately accrescent, in fruit 2 to 3 lines long; nutlets not bristly; scar circular, exactly basal, separated by a slight constriction from the body of the nutlet; Great Valley, South Coast Ranges and cismontane S. Cal........14. *A. leptoclada.*

Calyx markedly accrescent, in fruit 3 to 5 lines long; nutlets with hairy-tufted bristles; scar ovate or deltoid, lateral but reaching the base of the nutlet; Great Valley and Livermore Valley........15. *A. humistrata.*

2. Scar distinctly above the base on the ventral side, deeply excavated or hollowed, large (¼ to ½ as long as the nutlet); nutlets armed with minute spine-like bristles or barbed prickles (except A. glyptocarpa and A. distantiflora).

Stems rigid, prostrate; calyx strongly accrescent, the lobes directed to one side; nutlets white-reticulate on a brown ground, the ridges with microscopic tufts of bristles..16. *A. scripta.*

Stems erect or ascending; calyx not strongly accrescent, remaining symmetrical.

Nutlets with the body quadratish or somewhat hexagonal and abruptly narrowed to a beak-like apex.

Nutlets arched and incurved at apex, destitute of bristles, the beak not compressed.

Corolla 2 to 3 lines broad; nutlets sharply rugose dorsally, the rugae forming small, irregular or imperfect areolae, the areolae papillate; n. Sierra Nevada foothills and Lake Co........17. *A. glyptocarpa.*

Corolla ¾ line broad; nutlets transversely tuberculate-rugose dorsally or interrupted-rugose, the rugae separated by lineate grooves; cent. and n. Sierra Nevada foothills........18. *A. distantiflora.*

Nutlets not arched, not incurved at apex, armed on the keels and lateral angles with a few spines (the spines rarely absent); apex of the nutlets beak-like, laterally compressed; n. Sierra Nevada foothills and bordering plain........19. *A. austinae.*

Nutlets broadly ovate, acute (not abruptly narrowed at apex); calyx in anthesis tawny-hirsute or tawny-tipped.

Nutlets thickly set with slender distinct barbed spines, not rugulose ventrally; cent. Cal. to n. Cal........20. *A. greenei.*

Nutlets dorsally rugose-reticulate, the thin rugae and the surface generally armed with barbed spines dilated at base (the spines rarely absent); ventral side with a narrow band of smooth white convolute rugae either side of carina; cent. Cal. to s. Cal........21. *A. acanthocarpa.*

1. **A. mollis** Greene. Densely leafy plant, the stems 1 to several from the base, spreading or ascending, 2 to 7 inches high, densely spreading-pilose; leaf-blades linear, obtuse, densely ascending-hirsute with long soft hairs, 1½ to 3¼ inches long; racemes dense or at length loose, 1 to 3 inches long, bractless; corolla 2½ to 3 lines broad; nutlets ovate, irregularly rugose-reticulate with very small or minute areolae little or no wider than the rugae; ventral side of nutlets markedly keeled down to the ovate sub-basal scar; dorsal side of nutlets shortly keeled at apex, the lateral angles with a somewhat evident keel; entire surface of nutlets thickly papillate microscopically.

Moist alkaline flats and borders of ponds, 4000 to 5500 feet: east side of the Sierra Nevada from Sierra Co. to Modoc Co., also occasionally on west slope in high easterly valleys of Plumas Co. Extending to western Nevada and north to eastern Oregon. July.

Locs.—Sierra Valley; Portola, Plumas Co., *K. Brandegee;* Pitt River, near Alturas, *R. M. Austin;* Egg Lake, w. Modoc Co., *M. S. Baker.*

Refs.—ALLOCARYA MOLLIS Greene, Pitt. 1:20 (1887); Jepson, Man. 851 (1925). *Eritrichium molle* Gray, Proc. Am. Acad. 19:89 (1883), type loc. Sierra Valley, Sierra Co., *Lemmon. Krynitzkia mollis* Gray, l.c. 20:267 (1885). *Plagiobothrys mollis* Jtn., Contrib. Gray Herb. 68:74 (1923).

2. **A. vestita** Greene. Rank plant with ascending stems 1 to 1½ feet high; herbage conspicuously and densely pilose throughout even to the calyx; spikes 3 to 6 inches long, bractless; corolla about 2 lines broad; fruiting calyces discrete; nutlets brown, nearly 1 line long, regularly reticulate, the areolae several times broader than the rugae; dorsal side of nutlets keeled shortly at apex or from the apex to below the middle, the keel in either case vanishing in the meshes of the reticulation, or not keeled; lateral angles rounded; ventral side of nutlets strongly ridged down to the ovate or roundish scar, which is bounded toward the base by a horseshoe-shaped ridge; areolae and rugae densely papillate microscopically.

Valley flats, 10 to 400 feet: southern Sonoma Co. June-July.

Endemism note.—Allocarya vestita, a rare endemic, is known only from Petaluma and has been collected but once. It exhibits an unusually localized occurrence.

Refs.—ALLOCARYA VESTITA Greene, Erythea 3:125 (1895), type loc. Petaluma, Sonoma Co., *Congdon;* Jepson, Man. 851 (1925). *A. mollis* var. *vestita* Jepson, Fl. W. Mid. Cal. 442 (1901), ed. 2, 345 (1911). *Plagiobothrys mollis* var. *vestitus* Jtn., Contrib. Gray Herb. 68:75 (1923).

3. **A. lithocarya** Greene. Stems erect, sparingly branched, 7 to 10 inches high; leaf-blades linear, ¾ to 1½ inches long; racemes becoming loose and more or less leafy-bracted, 1 to 3½ inches long; corolla 1 line broad; nutlets ovate, smooth and whitish or vitreous-shining, lightly mottled, rounded dorsally and keeled, flattish on the ventral side, the ventral keel hidden by lateral folds for nearly its entire length; scar narrowly linear, likewise hidden by the folds.

Moist spots, 1000 to 1500 feet: valleys in Lake and Mendocino Cos. bordering or near the Mayacamas Range. Apr.-May.

Geog. note.—This species, Allocarya lithocarya, one of the rarest species of its genus in California, has been seldom collected. A narrow endemic, with the outstanding features of a true endemic, it is known only from the original station, Lakeport (in western Lake Co.), and from Potter Valley (*Nettie Purpus*) in eastern Mendocino Co.

Refs.—ALLOCARYA LITHOCARYA Greene, Pitt. 1:12 (1887); Jepson, Man. 852 (1925). *Krynitzkia lithocarya* Greene; Gray, Proc. Am. Acad. 20:265 (1885), type loc. Lakeport, Lake Co., *Curran. Plagiobothrys lithocaryus* Jtn., Contrib. Gray Herb. 68:76 (1923).

4. **A. chorisiana** Greene. Stem erect, branching, 2 to 11 (or 16) inches high, at length diffuse with decumbent branches, very leafy below; herbage subglabrous or thinly setulose; basal leaves alternate or opposite, the blades linear, 1 to 4 inches long; racemes elongated, at length very loose, leafy below; fruiting pedicels 1 to 7 lines long, mostly longer than calyx; calyx little accrescent, about 1 line long, the lobes at length spreading; corolla 3 to 4 lines wide; nutlets ovate, ½ line long, drab or brownish, keeled ventrally only, or also dorsally toward the apex, the dorsal side sparingly rugulose or imperfectly rugulose-reticulate and minutely or obscurely tuberculate; ventral keel set in a groove; scar linear.

Grassy hillslopes, 5 to 300 feet: near the coast from San Francisco Co. to the Santa Cruz Mts. Apr.-May.

Locs.—San Francisco, *Kellogg;* Crystal Springs Lake, San Mateo Co., *C. F. Baker* 429; Belmont, San Mateo Co., *Greene;* Santa Cruz, *Davy.*

Var. **myriantha** (Greene) Jepson. Pedicels nearly all shorter than the calyx; corolla 1 to 1½ (or 2½) lines broad; nutlets brownish, rugulose, minutely and sparingly tuberculate, keeled one-third or half-way down the back.—Along the coast line or near it, from the Santa Cruz Mts. (Mt. Hermon, *S. Brown*) to the Monterey coast (Pt. Joe, *E. Ferguson* 302; Carmel, *Newlon* 115) and San Luis Obispo coast (San Simeon, *K. Brandegee*).

Refs.—ALLOCARYA CHORISIANA Greene, Pitt. 1:13 (1887); Jepson, Fl. W. Mid. Cal. 442 (1901), ed. 2, 345 (1911), Man. 852 (1925). *Myosotis chorisiana* Cham., Linnaea 4:444 (1829), type loc. San Francisco, *Chamisso. Eritrichium chorisianum* DC., Prodr. 10:130 (1846). *Krynitzkia chorisiana* Gray, Proc. Am. Acad. 20:267 (1885). *Plagiobothrys chorisianus* Jtn., Contrib. Gray Herb. 68:77 (1923). *Eritrichium connatifolium* Kell., Proc. Cal. Acad. 2:163 (1863), type loc. vic. San Francisco, *Bloomer. A. jonesii* Brand; Fedde, Repert. Sp. Nov. 18:313 (1922), type loc. Santa Cruz, *Jones* 2326. Var. MYRIANTHA Jepson, Man. 852 (1925). *A. myriantha* Greene, Erythea 3:125 (1895), type loc. Monterey, *Greene. A. hickmanii* Greene, Pitt. 1:13 (1887), type loc. s. Monterey Co., *Hickman. A. chorisiana* var. *hickmanii* Jepson, Man. 852 (1925). *Plagiobothrys chorisianus* var. *hickmanii* Jtn., Contrib. Arn. Arb. 3:49 (1932).

5. **A. stipitata** Greene. Stems few or usually many from the base, mostly simple, slender, somewhat spreading, commonly 9 to 12 inches high; herbage sparsely setulose; leaf-blades linear or linear-oblanceolate, 1 to 3 inches long, attenuate into a broad petiole-like base; pedicels slightly turbinate-thickened beneath the flower; calyx-lobes at length brownish and often spreading, strongly accrescent, becoming 3 to 4 lines long; corolla 2 to 3 lines broad, white with yellow eye or the eye changing to white; nutlets narrowly ovate, somewhat flattened dorsally, transversely rugose dorsally and more or less finely tuberculate, strongly keeled ventrally down to the base, the dorsal keel obsolete except above the middle; apex of nutlets somewhat laterally compressed, thus forming a beak-like summit.

Beds of former vernal pools or in hog-wallows, alkaline playas or depressions of the plains or valley flats, 10 to 7600 feet: Coast Range valleys from San Benito Co. to Napa Co.; lower San Joaquin Valley; Sacramento Valley. North to Oregon. Mar.-May.

Tax. note.—Aside from the features of the nutlets and aside from size of corolla, Allocarya stipitata and A. californica may be differentiated by certain characters of the flowers. The corolla-throat in A. stipitata is open with only little evidence of processes or crests; the calyx-lobes are rather narrow, the corolla-tube visible between them. In Allocarya californica, the tube is closed by processes and there is no obvious throat; the calyx-lobes are somewhat longer than in A. stipitata and tend to conceal the corolla-tube.

The ventral keel of the nutlet in A. stipitata is at base abruptly bent downward (at a right angle) to the basal scar. Dorsally the nutlet is transversely and rather openly rugulose with tubercles or papillae in the intervals, the lower part frequently not tuberculate but often smooth.

Regarding an exact locality for the type of Allocarya stipitata, C. V. Piper says (Contrib. U. S. Nat. Herb. 22:94): "Three specimens are marked 'type' in the herbarium of the University of California, according to Mrs. T. S. Brandegee, as follows: Vallejo, *Greene*, Apr. 20, 1874; Antioch, *Mrs.* [*K.*] *Brandegee*, April, 1883[at that time the name of the collector was Mrs. M. K. Curran]; Elmira, *Greene*, May 3, 1886." This statement needs qualification. The notations on the specimens referred to actually read "part of type material" and are in the handwriting of K. Brandegee (Mrs. T. S. Brandegee), not in the hand of E. L. Greene. A specimen collected at Elmira, Apr. 1883, by M. K. Curran is also indicated as "part of type material" by K. Brandegee. The label of the Vallejo specimen was, however, written by Greene and the determination is in his hand, but none of his early specimens bear a contemporary notation, "type." Since the Vallejo specimen is the earliest and was collected and named by Greene, Vallejo is here taken as the type locality.

Locs.—Coast Ranges: Hollister, *S. Brown;* Livermore, *Hoover* 1732; Monroe School, near Forestville, Sonoma Co., *M. S. Baker* 2053x; Napa jct., *Sonne.* Lower San Joaquin Valley: Grayson, Stanislaus Co., *Hoover* 240; Stockton (7 mi. e.), *Hoover* 1924. Sacramento Valley: Vacaville, *Jepson* 6792; College City, Colusa Co., *Alice King;* Willows, Glenn Co., *Jepson* 21,182; Yuba City, *Jepson* 21,180.

Var. **micrantha** Mcbr. Corolla ¾ to 1½ lines broad.—South Coast Ranges toward the interior from San Luis Obispo Co. to Santa Clara Co.; Great Valley from Tulare Co. to Shasta Co.; Sierra Nevada (west slope) from Tulare Co. to Calaveras Co.; transmontane Cal., scattered stations from San Diego Co. to Nevada Co. The var. micrantha is not infrequently found associated with the species and yet maintaining in any one colony a size difference in corolla. Corolla size, therefore, in this instance, has a definite significance.

Locs.—South Coast Ranges: Cholame Valley, se. San Luis Obispo Co., *Jepson* 12,032; Madrone, Santa Clara Valley, *Jepson* 21,177. San Joaquin Valley: Goshen, Tulare Co., *S. Brown;* Friant, Fresno Co., *Jepson* 12,902; Califa, Madera Co., *Jepson* 15,162; Simmons Creek, 6 mi. sw. of Eugene, n. Stanislaus Co., *Jepson* 18,037; Byron, e. Contra Costa Co., *Greene;* Stockton, *H. P. Fitch.* Sacramento Valley: Vacaville, *Jepson* 21,185; Wolfskill sta., nw. Solano Co., *Jepson* 10,405; Plumtree sta., se. Yolo Co., *Jepson* 19,928; Rio Linda, n. Sacramento Co., *Jepson* 16,574; Honcut, w. Butte Co., *S. Brown;* Anderson, Shasta Co., *Alice King.* Sierra Nevada, w. slope: Giant Forest, Tulare Co., *K. Brandegee;* Yosemite, *Hall* 8875; Salt Springs Valley, Calaveras Co., *Tracy* 5664. Transmontane Cal.: Campo, se. San Diego Co., *Parish* 10,814; Andrews Camp, w. Inyo Co., *K. Brandegee;* Boca, e. Nevada Co., *K. Brandegee.*

Refs.—ALLOCARYA STIPITATA Greene, Pitt. 1:19 (1887), based on spms. from "central part of Cal." (lectolocus, Vallejo), *Greene;* Jepson, Fl. W. Mid. Cal. 443 (1901), ed. 2, 345 (1911), Man. 852 (1925). *Lappula stipitata* Druce, Rep. Bot. Exch. Club Brit. Isl. 5:38 (1918). *Plagiobothrys stipitatus* Jtn., Contrib. Gray Herb. 68:77 (1923). Var. MICRANTHA Mcbr., Contrib. Gray Herb. 65:43 (1922); Jepson, Man. 852 (1925). *A. stipitata* subsp. *micrantha* Piper, Contrib. U. S. Nat. Herb. 22:94 (1920), type loc. Stockton, *Greene. P. stipitatus* var. *micranthus* Jtn., Contrib. Arn. Arb. 3:45 (1932).

6. **A. glabra** Mcbr. Stems few or several from the base, erect, mostly simple and flowering from below the middle, 5 to 12 inches high; herbage subglabrous or thinly puberulent or setulose; leaf-blades linear, 1 to 2½ inches long; spikes rather dense, 2 to 7 inches long, the flowers strictly unilateral in 2 rather marked rows, the rachis fistulous-enlarged; calyx cleft about ½ (sometimes ¾) into lanceolate or spatulate lobes, the sinus next the axis much deeper than the others; calyx-tube with 5 strong callous-thickened ridges which disappear upward at the middle of the lobes; corolla ½ line broad; nutlets ovate, contracted to an acuminate or beak-like apex; dorsal side of nutlets flattish, slightly or obscurely fine-tuberculate and rugulose, keeled towards apex, the ventral side convexly 2-planed and carinately ridged,

the lateral angles sharply defined; scar circular, exactly basal, separated from the body of nutlet by a constriction.

Salt marshes and alkaline flats, 5 to 200 feet: western Alameda Co. south through the Santa Clara Valley to northern San Benito Co. Apr.-May.

Geog. note.—A rather narrow and for this genus a well-marked endemic, Allocarya glabra has been only sparingly collected. The following stations are here noted: Mount Eden, *K. Brandegee;* Alvarado, *Jepson* 21,215; Santa Clara, *Michener & Bioletti;* Los Gatos (Contrib. U. S. Nat. Herb. 22:95); Hollister, *Hoover* 3485. The calyx has marked peculiarities; sometimes the outer lobes are united nearly to the summit.

Refs.—ALLOCARYA GLABRA Mcbr., Proc. Am. Acad. 51:543 (1916); Jepson, Man. 851 (1925). *Lithospermum glabrum* Gray, Proc. Am. Acad. 17:227 (1882), based on *Lemmon* 485 (per herb. label) and recorded as from Apache Pass, s. Ariz., but probably mistakenly through confusion of labels (cf. Zoe 5:94). *Plagiobothrys glaber* Jtn., Contrib. Gray Herb. 68:77 (1923). *A. salina* Jepson, Fl. W. Mid. Cal. 442 (1901), type loc. Hall sta., near Alvarado, Alameda Co., *Jepson* 21,215; ed. 2, 345 (1911), (typ. in Herbario Jepsoniano).

7. **A. cooperi** Greene. Stems many from the base, diffusely branched, 4 to 8 inches high; herbage scattered-hispidulose; leaf-blades linear, somewhat succulent, ½ to 2½ inches long; spikes 1 to 4 inches long, the flowers at length discrete or remote; pedicels readily deciduous in age; calyces hispid; corolla 1¼ to 2¼ lines broad; nutlets ovate, abruptly acute above the middle, transversely rugose dorsally or the lower part finely tuberculate, the ventral side keeled, somewhat reticulate-rugose; both dorsal and ventral sides somewhat flattish; scar linear.

Margins of desert springs or in seepage spots, 2900 to 4500 feet: central Mohave Desert and north to Inyo Co. May.

Locs.—Mohave Desert: Rabbit Sprs., *Jepson* 5939. Inyo Co.: Alabama Hills, *S. W. Austin* 457; betw. Bishop and Laws, *K. Brandegee.*

Refs.—ALLOCARYA COOPERI Greene, Pitt. 1:19 (1887); Jepson, Man. 852 (1925). *Eritrichium cooperi* Gray, Proc. Am. Acad. 19:89 (1883), type loc. Camp Cady (near Newberry), Mohave Desert, *Cooper. Krynitzkia cooperi* Gray, l.c. 20:267 (1885). *Plagiobothrys parishii* Jtn., Contrib. Gray Herb. 68:78 (1923).

8. **A. undulata** Piper. Stems 1 or several from the base, 3 to 6 inches high; herbage thinly strigose or ascending-hirsute; leaf-blades oblong to linear, ¼ to 1 inch long; spikes 1 to 4½ inches long, the flowers discrete or sometimes at length remote; calyx densely hirsute; corolla 1½ lines broad; nutlets ovate, irregularly but rather closely rugulose dorsally, the dorsal side flattish, the ventral side puncticulate or rugulose, keeled from the apex to just below the middle; tubercles or papillae none or a few minute ones in the interspaces or grooves; scar linear or line-like, usually set in a shallow depression, about ⅓ length of nutlet.

Moist summer beds of winter streams or former rainpools, 10 to 1200 feet: east side of the Great Valley; Coast Ranges from Mendocino Co. to San Mateo Co.; cismontane Southern California. May-June.

Locs.—Great Valley: Pleasant Grove, Sutter Co., *Hoover* 1144; Thornton (5 mi. nw. and hence in s. Sacramento Co.), *Hoover* 2191; Linden, n. San Joaquin Co., *Hoover* 2398; Madera, *Hoover* 1250; Orange Cove, Fresno Co., *Hoover* 1271. Coast Ranges: Round Valley, ne. Mendocino Co., *Tracy* 15,778; Lagunitas, Marin Co. (Contrib. Arn. Arb. 3:47); Pilarcitos Lake, San Mateo Co., *Davy* 1143. Cismontane S. Cal.: Santa Barbara, *T. Brandegee;* Ojai, Ventura Co. (Contrib. Arn. Arb. 3:47); Lake Elsinore, sw. Riverside Co. (Contrib. Arn. Arb. 3:47); Ramona, San Diego Co. (Contrib. Arn. Arb. 3:47).

Refs.—ALLOCARYA UNDULATA Piper, Contrib. U. S. Nat. Herb. 22:104 (1920), type loc. Santa Barbara, *Eastwood. A. chorisiana* var. *undulata* Jepson, Man. 852 (1925). *Plagiobothrys undulatus* Jtn., Contrib. Arn. Arb. 3:46 (1932). *A. inornata* Piper, l.c. 22:106 (1920), type loc. Ramona, San Diego Co., *T. Brandegee* 3380. *A. corrugata* Piper, l.c. 22:110 (1920), type loc. Guernsey, Kings Co., *Eastwood.*

9. **A. stricta** Greene. Stems 1 to several from the base, 6 to 15 inches high; herbage glabrous or nearly so; leaf-blades linear, 1 to 4 inches long; spikes 1 to 7 inches long, the flowers mostly discrete; corolla 2 lines broad; dorsal side of nutlets keeled to middle, transversely short-rugulose and thickly tuberculate or finely

papillate, the rugae rough; ventral side irregularly and closely rugulose, keeled down to the scar; scar narrow-lanceolate to deltoid-lanceolate, slightly excavate, ⅖ as long as nutlet.

Wet alkaline meadows, near springs, 350 to 400 feet: upper Napa Valley. Mar.-May.

Geog. note.—Found only near the sulphur springs on the alkaline flats at Calistoga, Allocarya stricta is an extremely narrow endemic. It is not rare in its locality and has been collected many times. The characters of it may, perhaps, preclude confusion with any other species.

Refs.—ALLOCARYA STRICTA Greene, Pitt. 2:231 (1892), type loc. Calistoga, Napa Co., *Greene;* Jepson, Man. 853 (1925). *A. californica* var. *stricta* Jepson, Fl. W. Mid. Cal. 443 (1901), ed. 2, 346 (1911). *Plagiobothrys strictus* Jtn., Contrib. Gray Herb. 68:78 (1923).

10. **A. californica** Greene. Stems several from the base, decumbent or spreading, 3 to 14 inches long; herbage strigose; leaf-blades linear-oblanceolate, ⅓ to 1½ inches long; racemes 2 to 9 inches long, the flowers discrete or usually remote; corolla ¾ to 1¼ lines broad; nutlets ovate, irregularly rugulose transversely, the rugae long or short and often branched or merging with short oblique rugae and thus imperfectly reticulate, the interspaces thickly and finely tuberculate; ventral side keeled down to and continuous with the scar; scar lateral but reaching the base, deltoid or ovate; entire surface of nutlet microscopically scaly-dotted.

Grassy clay slopes or moist flats, 15 to 500 feet: coast line from San Francisco to Del Norte Co.; in Humboldt Co. extending to the interior. North to Oregon. Apr.-May.

Geog. note.—As here described, Allocarya californica is a species primarily of the coast line, ranging from San Francisco to Del Norte County. The following collections are first cited: San Francisco, *J. T. Howell;* Hussey ranch, Pt. Reyes, *Davy* 6814; Bodega Bay, *K. Brandegee;* Gualala, s. Mendocino coast, *Gwen Newell;* Fort Bragg, *Mathews* 67. The San Francisco collection represents the original station for the form Allocarya diffusa Greene; the remaining collections (as just cited, save that from Fort Bragg) were named Allocarya areolata by C. V. Piper in his revision of the genus. Collections from Humboldt Co. are next cited: Petrolia, Mattole Valley, *Tracy* 9962; Cape Mendocino, *Tracy* 15,963; Holmes Flat, lower Eel River, *Tracy* 13,957; Alton, *Tracy* 3680; Fort Baker ranch, Van Duzen River, *Tracy* 10,274; Eureka, *Tracy* 3009. Of these northern stations, Stone Lagoon, Humboldt Co., *Tracy* 13,949 and some others, in greater or less degree, represent indefinite transitions to the form A. reticulata Piper. A collection from Del Norte Co. is last cited: Gasquet, *Parks & Tracy* 11,176.

All these collections are from stations on or very near the coast line and comprehend a natural area in species distribution. Moreover, all of them, including that from San Francisco, agree habitally and agree in pubescence and in inflorescence; they agree in nutlets as to size, shape, ventral carina and scar. The dorsal interspaces or areolae of the nutlets are in all cases finely tuberculate save that in the A. reticulata form the areolae, although smooth as to the formal type, are usually finely papillate. The whole surface of the nutlets is in every collection microscopically scaly-dotted. The rugae form inconstant patterns, as is usual in this genus, but in general the short or long rugae tend to set off irregular interspaces or complete or imperfect areolae in a various manner.

Variations of rugae patterns of the nutlets as found on one individual (Bodega Bay, *K. Brandegee*) may be expressed in a condensed statement as follows: (a) dorsal surface irregularly but markedly rugose transversely, scarcely at all reticulate; (b) dorsal surface irregularly rugose transversely only at middle and above, scarcely at all reticulate; (c) dorsal surface rugose transversely only at the middle, not reticulate; (d) entire dorsal surface markedly reticulate with small areolae; (e) dorsal surface at middle reticulate; (f) dorsal surface weakly and irregularly reticulate at middle. In these various patterns a dorsal keel may be present at apex or it may be absent. In all cases, too, the dorsal interspaces or areolae and especially the non-rugulose areas are more or less finely tuberculate. The extremes of nutlet features in this series, as taken from one individual, differ more from each other than from the nutlets characteristic of the plants found at the other stations along the coast line as cited above.

It may be further pointed out that some of the nutlets in the collection from Bodega Bay, *K. Brandegee,* agree well with those of Allocarya scalpta Piper (Alder Point Flat, Humboldt Co.). Nutlets of the former may be selected which seem as if exact replicas of nutlets selected from the type collection of A. scalpta.

It is, then, an obvious summation that Allocarya californica, as here described, presents a population essentially homogeneous in all fundamental aspects and morphological features and in its distribution represents a wholly natural area. It is, however, not strongly differentiated from A. cusickii var. vallicola of the interior of California and there are stations back of the coast line in Mendocino and Humboldt counties which seem to represent intermediate states.

Allocarya californica has been described as having the rugae on the ventral side of nutlets distinct from keel as contrasted with the rugae on ventral side joined to the keel or closely approaching it in A. cusickii var. vallicola. This distinction has been proposed as a differentia but it is difficult in most cases to apply and is not thought significant. Moreover, for A. californica there are obscurities in another direction. Differentiae between A. californica (especially as represented by Humboldt County plants) and the Alaskan A. plebeia Greene (Lithospermum plebeium Cham., Linnaea 4:446,—1829, type loc. Unalaska, Alas., *Chamisso*) have not as yet been clearly established. It seems wiser, however, at this stage of investigation, to retain the concept Allocarya californica as here set up for this group of the California coast line, a group which is fairly definite in its main features.

In Humboldt Co., the ordinary state of A. californica passes into a strain, var. RETICULATA (Piper) Jepson comb. n., in which the nutlets are delicately circular-reticulate or pentagonal-reticulate or quadratish-reticulate, with the areolae smooth or sometimes finely papillate: Bear River (10 mi. from ocean), *Tracy* 15,351; Eureka, *Tracy* 2111; Butler Valley, Mad River, *Tracy* 5825; Bald Mt., *Tracy* 15,009; Big Lagoon, *Tracy* 13,923. Since the intergrades are many, this form is scarcely worth separation or notation. The next variety is more important since the character of the nutlet is associated with a very slender spike and a large corolla.

Var. **minuta** (Piper) Jepson & Hoover comb. n. Stems 1 or several from the base, simple or branching, erect, slender, 6 to 10 inches high; calyx small (¾ to 1 line long); corolla large in proportion to the calyx (2 lines broad); nutlets small (⅓ to ½ line long), irregularly fine-reticulate over the entire back or only at the middle, not tuberculate.—Wet places in valleys, 350 to 1000 feet: Eel River near Fort Seward. In its nutlets this form is very close to var. reticulata.

Refs.—ALLOCARYA CALIFORNICA Greene, Pitt. 1:20 (1887), as to the name, which rests on *Myosotis californica* F. & M., Ind. Sem. Hort. Petrop. 2:42 (1835), a transcript of which is printed in Erythea 2:149,—1894. The type locality for Myosotis californica is given as Fort Ross, Sonoma Co. It is true, in the case of the Russian colony, that some of the plants of the Russian collectors were gathered on expeditions into the interior—but failing contrary evidence, as in this instance, the specific locality Fort Ross must be assumed as authentic, since the plant here believed to be Myosotis californica F. & M. grows near Fort Ross. Gray transferred Myosotis californica to Krynitzkia but applied the binomial to the inland species mainly. Greene, too, had chiefly in mind the interior plant. In publishing Allocarya californica, he cited the original publication of Myosotis californica F. & M. and indicated as range, "from the coast to the foothills of the Sierra Nevada," thus, in theory at least, including the coastal plant. His binomial must, therefore, nomenclatorially, go to the coastal species, although actually, in practice, he applied the name mainly and probably exclusively to the plant of the interior, here taken to be a different species.

The synonymy of Allocarya californica (F. & M.) is as follows: *Eritrichium californicum* A.DC., Prodr. 10:130 (1846). *Krynitzkia californica* Gray, Proc. Am. Acad. 20:266 (1885), in part. *A. diffusa* Greene, Pitt. 1:14 (1887), type loc. U. S. Marine Hospital, San Francisco, *Greene;* Jepson, Fl. W. Mid. Cal. 443 (1901), Man. 853 (1925). *Plagiobothrys diffusus* Jtn., Contrib. Arn. Arb. 3:77 (1932). *A. scalpta* Piper, Contrib. U. S. Nat. Herb. 22:104 (1920), type loc. Alder Point Flat, Humboldt Co., *Tracy* 1878; Jepson, Man. 852 (1925). *A. areolata* Piper, l.c. 22:105 (1920), type loc. Mendocino, *Pringle*. *A. dispar* Piper, l.c. 22:109 (1920), type loc. Agnes, Curry Co., Ore., *J. C. Nelson* 1433. *Plagiobothrys reticulatus* var. *rossianorum* Jtn., Contrib. Arn. Arb. 3:79 (1932), name based on Myosotis californica F. & M. Var. RETICULATA Jepson. *A. reticulata* Piper, l.c. 22:105 (1920), type loc. Holmes Flat, Eel River, Humboldt Co., *Tracy* 4691. *A. minuta* var. *reticulata* Jepson, Man. 852 (1925). *Plagiobothrys reticulatus* Jtn., Contrib. Arn. Arb. 3:78 (1932). Var. MINUTA Jepson & Hoover. *A. minuta* Piper, Contrib. U. S. Nat. Herb. 22:104 (1920), type loc. Fort Seward, Humboldt Co., *Tracy* 4469; Jepson, Man. 852 (1925).

11. **A. cusickii** Greene. Stems several to many from the base, erect or diffuse or decumbent, 4 to 10 inches high; herbage ascending-hispid or spreading-hispid; leaf-blades linear, ½ to 1½ inches long; spikes ¼ to 1 inch long; calyx only slightly accrescent; corolla ½ to 1½ lines broad; nutlets ovate, a little contracted or attenuate above the middle to a short lanceolate beak, slightly flattish dorsally and ventrally with the beak a little obcompressed, transversely rugose dorsally and partially areolate, the intervals minutely papillate; ventral side keeled; scar linear, strictly lateral but reaching base of nutlet, usually set in a broad depression.

Montane flats and meadows, 4000 to 6100 feet: easterly summits or east side of the Sierra Nevada from Placer Co. to Modoc Co. East to Utah and north to Oregon. June.

Locs.—Summit Soda Sprs., Placer Co., *Shockley* 322; betw. Vinton and Beckwith, e. Plumas Co.; Honey Lake, *T. Brandegee;* Goose Lake Valley, Modoc Co., *R. M. Austin;* Twelve-mile Creek, Warner Mts., *L. S. Smith* 1259.

The following cismontane variety differs from the species only in the shape of the nutlet and in that feature only dubiously or uncertainly, but is well segregated geographically from the intramontane-transmontane species.

Var. **vallicola** Jepson nom. n. Stems several to many from the base, 4 to 14 inches high; herbage ascending-hispid; spikes 2 to 8 inches long, loose; corolla 1 to 1½ lines broad; nutlets ovate, the dorsal side closely (or sometimes openly) and irregularly rugulose transversely and shortly keeled towards the apex, or the keel obsolete, the grooves or interspaces smooth or sometimes with a few fine papillae; ventral side keeled and obliquely rugulose, the scar ovate or linear, obliquely basal.—Moist flats in heavy adobe or rich soils, 10 to 4700 feet: throughout cismontane California back of the coast line. North to Oregon. Apr.-June.

Locs.—Cismontane S. Cal.: La Jolla, San Diego Co., *T. Brandegee;* Pine Hills jct., near Cuyamaca Mts., *Gander* 5957; Ramona, *T. Brandegee.* Coast Ranges: Paso Robles, *Condit & White;* San Miguelito rancho, near Jolon, s. Monterey Co., *Jepson* 1633; Mt. Eden, w. Alameda Co., *K. Brandegee;* Bennett Valley, Sonoma Co., *M. S. Baker* 2141b; Howell Mt., Napa Range, *Jepson* 21,171; Calistoga, *Jepson* 21,170; Mt. Hanna, Lake Co., *Jepson* 21,172; Lakeport, Lake Co., *Tracy* 5545; Willits, Mendocino Co., *Jepson* 1827; Round Valley, ne. Mendocino Co., *Tracy* 15,777; Yreka, *Butler* 732. Great Valley: Deadman's Creek (n. of El Nido), Merced Co., *Jepson* 17,489; Stockton, *Sanford* 337; Vacaville, *Jepson* 21,169; Sacramento, *H. F. Copeland* 1112; Chico, *E. B. Copeland;* Red Bluff, *Jepson* 21,165. Sierra Nevada: Success, Tulare Co., *Keck & Clausen* 3207; Ahwahnee, Madera Co., *Jepson* 12,833; Hodgdon ranch, near Tuolumne Grove, *Jepson* 10,520; Calaveritas Creek, Calaveras Co., *Tracy* 5684; Myers sta., Eldorado Co., *Ottley* 951; Big Mdws., e. Plumas Co., *Jepson* 4055; Goose Valley, Shasta Co., *Baker & Nutting;* Little Hot Springs Valley, sw. Modoc Co., *Baker & Nutting.*

Var. **debilis** (Brand) Jepson comb. n. Stems weak, 6 to 12 inches long; lowest flowers of the spikes almost basal, very remote; corolla ¾ line broad; ventral side of nutlets indistinctly rugose (ex char.).—Chico, Butte Co.

Refs.—ALLOCARYA CUSICKII Greene, Pitt. 1:17 (1887), type loc. Reno, Nev., *Curran. Plagiobothrys cusickii* Jtn., Contrib. Arn. Arb. 3:63 (1932). *A. cognata* Greene, Pitt. 4:235 (1901), type loc. Cache Valley, Utah, *Mulford. P. cognatus* Jtn., l.c. 3:59 (1932). *A. ambigens* Piper, Contrib. U. S. Nat. Herb. 22:96 (1920), type loc. betw. Vinton and Beckwith, e. Plumas Co., *Heller & Kennedy* 8682; Jepson, Man. 852 (1925). *A. microcalyx* Brand; Fedde, Repert. Sp. Nov. 19:71 (1923), type loc. betw. Vinton and Beckwith, e. Plumas Co., *Heller & Kennedy* 8680. *A. filicaulis* Brand, l.c. 19:72 (1923), type loc. "Soda Sprs., Nevada Co.," *Jones* 2428 (more specifically, Soda Springs sta., w. of Donner Lake). Var. VALLICOLA Jepson. *Krynitzkia californica* Gray, Proc. Am. Acad. 20:266 (1885) in great part, if not wholly, Great Valley plants; not Myosotis californica F. & M. (1835). *A. californica* Greene, Man. Reg. S. F. Bay 258 (1894) in great part, if not wholly, Great Valley plants; Jepson, Fl. W. Mid. Cal. 443 (1901), ed. 2, 346 (1911), Man. 853 (1925). *A. bracteata* Howell, Fl. Nw. Am. 481 (1901), type loc. Umpqua Valley, Ore. *Plagiobothrys bracteatus* Jtn., Contrib. Arn. Arb. 3:68 (1932). *A. commixta* Brand; Fedde, Repert. Sp. Nov. 18:312 (1922), type loc. Park ranch, Mt. Hamilton Range, *Heller* 8911. *A. piperi* Brand, l.c. 19:70 (1923), type loc. Napa, *Heller & Brown* 5361. *A. hillebrandii* Brand, l.c. 19:71 (1923), type loc. Oakland Hills, *Hillebrand. P. scopulorum* Jtn., Contrib. Gray Herb. 68:79 (1923) as to Californian plants, (?) not A. scopulorum Greene (1887) of the Rocky Mts. Var. DEBILIS Jepson. *A. charaxata* var. *debilis* Brand; Engler, Pflzr. 4^{252}:165 (1931), type loc. Chico, *Copeland* 3046. *A. conjuncta* Piper, Contrib. U. S. Nat. Herb. 22:109 (1920), type loc. Chico, *Copeland* 3046.

ALLOCARYA ACULEOLATA Piper, Proc. Biol. Soc. Wash. 37:94 (1924), type loc. Chico (ridge 10 mi. e.), *Piper* 5020. *Plagiobothrys bracteatus* var. *aculeolatus* Jtn., Contrib. Arn. Arb. 3:70 (1932). This differs from Allocarya cusickii var. vallicola in having barbed bristles on the nutlets. Nutlets with minute scabrous points sometimes occur in A. cusickii var. vallicola acc. R. F. Hoover and the plants are then hardly distinguishable from A. hispidula except by habit and occurrence at a low altitude.

12. **A. trachycarpa** Greene. Stems several or many from the base, diffuse or decumbent, 4 to 17 inches long; herbage thinly ascending-hispid; leaf-blades linear-oblanceolate, 1 to 2 inches long; racemes leafy-bracteate throughout or nearly so; calyx-segments spreading; corolla ¾ to 1½ lines broad; nutlets broadly ovate, transversely and mostly rough-rugulose or tuberculate-rugulose, the rugae distinct or connected irregularly by short rugae; dorsal interspaces or areolae finely tuberculate; ventral side obliquely rugulose, papillate in the grooves, the marked keel extending down to the scar; scar deltoid, deltoid-ovate or deltoid-orbicular, very near base but lateral, often markedly excavate, ⅓ length of nutlet, the bordering flange broad.

Valley floors, 10 to 1000 feet: Great Valley from Shasta Co. to Merced Co.; South Coast Ranges from Contra Costa Co. to San Luis Obispo Co.; coastal Los Angeles Co. Mar.-May.

Locs.—Great Valley: Anderson, Shasta Co., acc. *C. V. Piper;* Thornton (5 mi. nw.), Sacramento Co., *Hoover* 1062; French Camp, San Joaquin Co., *Sanford* 100; Tracy, San Joaquin Co., *Greene;* Los Banos (9 mi. w.), Merced Co., *Hoover* 1652. South Coast Ranges: Livermore, *Bioletti;* Coyote sta., Santa Clara Valley, *Jepson* 21,184; Jolon, Monterey Co., *Keck & Clausen* 3061; Estrella, San Luis Obispo Co., *Jared.* Los Angeles Co.: Gardena and Inglewood (Contrib. Arn. Arb. 3:75).

Refs.—ALLOCARYA TRACHYCARPA Greene, Pitt. 1:14 (1887); Jepson, Fl. W. Mid. Cal. 443 (1901), ed. 2, 346 (1911), Man. 853 (1925). *Krynitzkia trachycarpa* Gray, Proc. Am. Acad. 20:266 (1885), type loc. Walnut Creek, Contra Costa Co., *Brewer* 1007, not "Sonoma Co." (cf. Contrib. Arn. Arb. 3:76; also Brewer Fieldbook). *Plagiobothrys trachycarpus* Jtn., Contrib. Gray Herb. 68:78 (1923). *A. interrasilis* Piper, Contrib. U. S. Nat. Herb. 22:108 (1920), type loc. Hollister, *Setchell* (form with rounded ridges on nutlets).

13. **A. hispidula** Greene. Stems few or several from the base, spreading or ascending, 2 to 7 inches high; herbage spreading-hirsutulose or strigulose; leaf-blades linear, ½ to 1 (or 1½) inches long; spikes bracteate or interrupted-bracteate or bracteate at base only, loose, 1 to 5 inches long; corolla ¼ to ½ line broad; nutlets ovate, the dorsal side tuberculate-crowded or often irregularly rugulose and more or less reticulate with the areolae finely tuberculate, the ridges or tubercles microscopically hispidulose or short-bristly; ventral side obliquely rugulose and usually finely tuberculate, keeled; scar linear; bristles barbed at tip or naked.

Moist meadows or dry flats, 4000 to 8700 feet: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Modoc Co.; high North Coast Ranges from the Yollo Bolly Mts. to western Siskiyou Co. East to Nevada and Wyoming, north to Washington. May-Sept.

Tax. note.—Occasional plants of Allocarya hispidula, in which the scabrous points or short bristles of the nutlets are practically absent, are sometimes found growing and intergrading with the usual form of the species. The separation of such plants from Allocarya cusickii var. vallicola is a difficult problem but ordinarily the definitely lateral scar of Allocarya hispidula provides a reliable basis for distinction as against the obliquely basal scar of Allocarya cusickii var. vallicola.—R. F. Hoover.

Locs.—San Bernardino Mts.: Seeleys Flat (Contrib. U. S. Nat. Herb. 22:99). Sierra Nevada: Ramshaw Mdws., Kern Peak, *Jepson* 4964; Williams Mdw., South Fork Kings River, *Jepson* 762; Deadman Creek, e. Tuolumne Co., *Jepson* 6561; Dog Valley, e. Nevada Co., *Jepson* 21,163; Prattville, Plumas Co., *T. Brandegee;* Chico Mdws., Butte Co., *Heller* 11,496; Butte Creek Mdws., e. Tehama Co., *J. Grinnell;* Burney Spr., ne. Shasta Co., *Peirson* 10,290a; Big Bear Flat, se. of Bartle, se. Siskiyou Co., *Jepson* 20,108; Willow Creek, Clear Lake, Modoc Co., *J. T. Howell* 12,360. North Coast Ranges: South Yollo Bolly, *Jepson* 21,166; Corral Prairie, Trinity Summit, *Tracy* 14,226; Shackelford Cañon, Siskiyou Co., *Chandler* 1704.

Var. **tenera** (Greene) Jepson comb. n. Stems 7 to 12 inches high; spikes bracteate only at base; corolla 1¼ to 1¾ lines broad; tubercles of nutlets with short bristles (not barbed or not usually barbed) or merely microscopically and very thinly short-hispidulose; scar ovate or deltoid, lateral but reaching the base.—Moist meadows or stream borders, 500 to 4400 feet: middle and inner North Coast Ranges from Napa Co. to western Shasta Co.; thence east to Modoc Co. May-July.

Locs.—North Coast Ranges: Howell Mt., Napa Co., *Tracy* 12,453a; Oak Park Sprs., s. of Middletown, Lake Co., *Ferris* 6694; Indian Valley, ne. Lake Co., *Jepson* 8993; Shasta, Shasta Co., *Morse.* Northern Sierra Nevada: Forestdale, sw. Modoc Co., *Nutting.*

Refs.—ALLOCARYA HISPIDULA Greene, Pitt. 1:17 (1887), type loc. Bear Valley, San Bernardino Mts., *Parish* 1470; Jepson, Man. 853 (1925). *Plagiobothrys hispidulus* Jtn., Contrib. Arn. Arb. 3:71 (1932). *A. penicillata* Greene, Pitt. 1:18 (1887), type loc. Donner Lake, Nevada Co., *Greene.* *A. hispidula* var. *penicillata* Jepson, Man. 853 (1925). *A. cryocarpa* Piper, Contrib. U. S. Nat. Herb. 22:98 (1920), type loc. Lily Lake, Eldorado Co., *Eastwood.* *A. cervina* Piper, l.c. 22:100 (1920), type loc. Redding, *Heller* 7891. *A. nigra* Brand; Fedde, Repert. Sp. Nov. 19:71 (1923), type loc. Truckee, Nevada Co., *Heller* 7055a. Var. TENERA Jepson. *Allocarya tenera* Greene, Pitt. 3:109 (1896), type loc. Adams Sprs., Lake Co., *Emily Booth.* *Plagiobothrys tener* Jtn., Contrib. Arn. Arb. 3:66 (1932). *A. gracilis* Piper, Contrib. U. S. Nat. Herb. 22:98 (1920), type loc. Deer Flat, Shasta Co., *Hall & Babcock* 4276. *A. laxa* Piper, l.c., type loc. s. side of Mt. Shasta, *H. E. Brown* 590. *A. pratensis* Piper, l.c. 22:99 (1920), type loc. Bear Creek, Shasta Co., *Hall & Babcock* 4162. *A. vallata* Piper, l.c. 22:101 (1920), type loc. Goose Valley, Shasta Co., *Eastwood* 718. *A. scalptocarpa* Piper, l.c. 22:111 (1920), type loc. Burney, Shasta Co., *Eastwood.* *P. tener* var. *subglaber* Jtn., l.c. 3:67 (1932), type loc. Houghs Sprs. (5 mi. e.), Lake Co., *Heller* 1349a. *P. tener* var. *fallax* Jtn., l.c., type loc. Prattville, Plumas Co., *R. M. Austin.*

14. **A. leptoclada** Greene. Stems few or several, radiating horizontally from the root-crown, prostrate but with the tips ascending, 2 to 7 inches long, flowering from below the middle or from near the base; herbage somewhat succulent, glabrous or weakly hirsutulose; leaf-blades linear, ½ to 4½ inches long; spikes loose, 1 to 5 inches long; calyx slightly fleshy, cleft ½ or ⅔, accrescent in fruit and 2 to 3 lines long, the tube 5-ribbed; corolla ½ line broad; nutlets ovate or lanceolate, contracted slightly above the middle and the upper portion obcompressed; dorsal side of nutlets finely papillate and sparingly rugulose, otherwise smooth or sometimes with hairy-tufted bristles; ventral side keeled and weakly or obscurely rugulose or granulate; scar exactly basal, circular and usually separated from the body by a slight constriction.

Alkaline playas, adobe mud flats or beds of former vernal pools, 100 to 2000 feet: northern Sierra Nevada foothills; Great Valley from Colusa Co. to Kern Co.; inner South Coast Range in San Luis Obispo Co.; cismontane Southern California. South to Lower California, east to Utah (acc. I. M. Johnston), north to eastern Oregon and southern Idaho. Mar.-Apr.

Locs.—Northern Sierra Nevada foothills: Auburn (Contrib. Arn. Arb. 3:40). Great Valley: Williams, Colusa Co. (Contrib. Arn. Arb. 3:40); Antioch, *Davy;* South Dos Palos, w. Fresno Co., *J. T. Howell* 5098; Califa, Madera Co., *Jepson* 15,161; Semitropic, Kern Co., *Hoover* 543 (det. R. F. Hoover). Inner South Coast Range in San Luis Obispo Co.: Soda Lake, Carrizo plain, *Keck & Clausen* 3144. Cismontane S. Cal.: March Field, Riverside Co., *J. T. Howell;* Point Loma, San Diego, *Greene.*

Refs.—ALLOCARYA LEPTOCLADA Greene, Pitt. 3:109 (1896), type loc. Pine Creek, Nev., *Greene. Plagiobothrys leptocladus* Jtn., Contrib. Arn. Arb. 3:38 (1932). *Eritrichium californicum* var. *subglochidiatum* Gray, Bot. Cal. 1:526 (1876), type loc. Auburn, *Kellogg & Harford. Krynitzkia californica* var. *subglochidiata* Gray, Proc. Am. Acad. 20:266 (1885). *A. californica* var. *subglochidiata* Jepson, Fl. W. Mid. Cal. 443 (1901), ed. 2, 346 (1911). *A. subglochidiata* Piper, Contrib. U. S. Nat. Herb. 11:485 (1906). *A. divergens* Piper, l.c. 22:92 (1920), type loc. Corcoran, Kings Co., *Eastwood* 2874. *P. divergens* Jtn., Contrib. Gray Herb. 68:77 (1923). *A. charaxata* Piper, l.c. 22:96 (1920), type loc. Guernsey, Kings Co., *Eastwood* 3881 in part. *A. versicolor* Brand; Fedde, Repert. Sp. Nov. 19:71 (1923), type loc. Newport, Orange Co., *Nevin* 696.

15. **A. humistrata** Greene. Stems few or several from the base, mostly prostrate, flowering from near the base, 3 to 12 inches long; herbage subglabrous or thinly puberulent; leaf-blades linear, ½ to 1 inch long; spikes 2 to 4 inches long, the flowers remote; pedicels stout, in age commonly deflexed; calyx markedly accrescent, in fruit 3 to 5 lines long, the lobes "turned to one side, standing vertically in a row;" nutlets ovate, the dorsal side unequally or scantily tuberculate and short-rugulose, sparingly provided with short processes bearing a tuft of microscopic bristles; ventral side keeled, obliquely and rather regularly rugulose or sometimes very sparingly rugulose; scar ovate or somewhat deltoid, lateral but reaching the base.

Hog wallows and low places on the plains, 10 to 550 feet: Sacramento Valley; lower San Joaquin Valley; Livermore Valley. Apr.-May.

Locs.—Vina, Tehama Co., *Hoover* 2247; Colusa jct., *K. Brandegee;* Antioch, ne. Contra Costa Co.; Byron, e. Contra Costa Co., *Greene;* Oakdale (4 mi. s.), Stanislaus Co., *Hoover* 2011; Livermore Valley (e. edge), *Hoover* 3057.

Refs.—ALLOCARYA HUMISTRATA Greene, Pitt. 1:16 (1887), "San Diego throughout the state." This description covers what is now accepted as two species but it applies, argues C. V. Piper (Contrib. U. S. Nat. Herb. 22:92) "much better" to the plant at Antioch, also included by Greene in his description, than to the plant at San Diego. Collections had been made at Antioch, lower San Joaquin Valley, by M. K. Curran in 1884 and by E. L. Greene on Apr. 7, 1885. Greene's Antioch collection, the part of it preserved in his own herbarium, were, therefore, better taken as the type. The collection of Curran in the California Academy of Sciences Herbarium was, to be sure, also examined by Greene, but the notation "type" on the specimen was written by M. K. Curran (K. Brandegee). The following synonymy here finds place: *Plagiobothrys humistratus* Jtn., Contrib. Gray Herb. 68:77 (1923). *A. limicola* Piper, Contrib. U. S. Nat. Herb. 22:97 (1920), "San Joaquin Valley," *Greene. A. sigillata* Piper, l.c., type loc. Antioch, *Greene. A. humistrata* var. *similis* Jepson, Man. 853 (1925), type loc. Antioch, *K. Brandegee.*

16. **A. scripta** Greene. Stems prostrate, 1½ to 10 inches long; leaf-blades linear or narrowly linear-oblanceolate, 4 to 9 lines long; corolla 1 line broad; nutlets ovate, acute, brown, the dorsal side finely white-keeled and finely white-reticulate, the ridges of the reticulations irregularly beset with tufts of bristles; dorsal areolae large, smooth or papillate; ventral side of nutlets with a high thin keel ending at base in a hollow scar; scar very broad, ¼ as long as nutlet, the pit surrounded by a broad border or margin.

Moist banks, in gravelly soil, 300 to 500 feet, very rare: lower margin of the Sierra Nevada foothills from Butte Co. (probably) to Stanislaus Co. Mar.-Apr.

Geog. note.—Allocarya scripta is, in this genus, a remarkable species. It was first discovered in April, 1887, by C. C. Parry, probably near Chico. Since that time, collections have rarely been made: once at Ione (Contrib. Arn. Arb. 3:28) and again near La Grange, Stanislaus Co. (*Hoover* 2053). Tiny tufted dwarfs, 6 to 11 lines high and almost acaulescent, have also been collected at La Grange (*Hoover* 1724). It seems likely that dwarfs of this sort, obscure and very small plants less than one inch high, have been hitherto overlooked.

Refs.—ALLOCARYA SCRIPTA Greene, Pitt. 1:142 (1887), type loc. "plains of the Sacramento," *Parry;* Jepson, Man. 854 (1925). *Plagiobothrys scriptus* Jtn., Contrib. Arn. Arb. 3:27 (1932).

17. **A. glyptocarpa** Piper. Branching at or near the base, 7 to 12 inches high; herbage setulose with short scattered setae; leaf-blades linear, 1 to 4 lines long; spikes 1 to 8 inches long, the flowers remote or at least discrete; corolla 2¼ to 4 lines broad; nutlets ovate, beaked or abruptly acute, the entire dorsal side strongly keeled and sharply rugose, the rugae forming complete or imperfect areolae; areolae 1 or 2-papillate; ventral side with a high thin keel down to the pit-like scar, either side of scar transversely rugose-crowded; scar triangular, ⅓ as long as nutlet.

Moist places along streams, 400 to 2000 feet: northern Sierra Nevada foothills from Butte Co. to Shasta Co.; inner North Coast Range in Lake Co. North to Oregon. May.

Locs.—Near Table Mt., n. of Oroville, *Heller* 11,202; Redding (4 mi. e.), *Hoover* 2273; Bartlett Sprs. (7 mi. e.), ne. Lake Co., *Kildale* 4964.

Refs.—ALLOCARYA GLYPTOCARPA Piper, Contrib. U. S. Nat. Herb. 22:90 (1920), type loc. "hills 8 mi. n. of Oroville," that is, near Table Mt., *Heller* 11,202. *Glyptocaryopsis glyptocarpa* Brand; Engler, Pflzr. 4^{252}:104 (1931). *Plagiobothrys glyptocarpus* Jtn., Contrib. Arn. Arb. 3:37 (1932). *P. glyptocarpus* var. *modestus* Jtn., Contrib. Arn. Arb. 3:38 (1932), type loc. Cedar Crest, near Grass Valley, Nevada Co., *Heller* 13,222; said to differ from typical A. glyptocarpa in the smaller corollas (1 to 1½ lines broad).

18. **A. distantiflora** Piper. Stems few from the base, slender, diffuse, 3 to 9 inches long, flowering from near the base and thus making elongated spikes; herbage strigulose, or the upper side of leaves subglabrous; leaf-blades linear-oblanceolate, ½ to 1 inch long; spikes 2 to 8 inches long, loose (the flowers usually remote), partially bracteate throughout; corolla ¾ line broad; nutlets ovate, beaked or abruptly acute, 3-keeled dorsally and transversely rugulose or lineate-muricate or lineate-tuberculate, the rugae or the rows of tubercles or murications separated by lineate grooves; ventral side regularly rugose transversely on each side of scar or at least partially regular, the ventral keel soon ending in a hollow scar with broad border or margin, the scar large, ½ length of nutlet.

Moist slopes or low places, 500 to 1200 feet: Sierra Nevada foothills from Tuolumne Co. to Madera Co., and possibly on the bordering San Joaquin plain from Madera Co. to Tulare Co. Apr.-May.

Locs.—Geographically and in some other respects, Allocarya distantiflora is little known. On the basis of specimens, only the following stations can be cited here: Moccasin Creek, Tuolumne Co., *Hoover* 3384; Bear Valley, Mariposa Co., *Hoover* 3405; O'Neals sta. (5 mi. w.), Madera Co., *Biswell* 137.

Refs.—ALLOCARYA DISTANTIFLORA Piper, Contrib. U. S. Nat. Herb. 22:91 (1920), type loc. "Madera" (probably in the Sierra Nevada foothills of Madera Co., to the east of Madera town), *Buckminster. Glyptocaryopsis distantiflora* Brand; Engler, Pflzr. 4^{252}:105 (1931). *Plagiobothrys distantiflorus* Jtn., Contrib. Arn. Arb. 3:36 (1932).

19. **A. austinae** Greene. Stems 1 or few from the base, erect or ascending, 4 to 10 inches high; herbage almost glabrous; leaf-blades linear, ½ to 3 inches long; flowers becoming remote in loose racemes, the racemes 1½ to 7½ inches long; calyces tawny-hirsute; corolla 1½ to 2 lines wide; nutlets with quadratish body and abruptly acute apex, the apex strongly obcompressed and rather longer than the body; surface of nutlets short-rugulose and tuberculate; dorsal keel thin and high, this and the lateral angles armed throughout or partially with 4 or 5 stout spines or processes; ventral keel or its bordering rugae partially spiny or destitute of spines; spines barbed above the middle or throughout.

Red gravelly clay of depressions on plains and in low hills, 100 to 1500 feet: Sierra Nevada foothills and east side of the Great Valley plain from Shasta Co. to Stanislaus Co. Mar.-May.

Locs.—Redding (5 mi. e.), *Hoover* 2267; Butte Co., foothills, *H. F. Copeland* 1113; Marysville Buttes (Contrib. U. S. Nat. Herb. 22:89); Stony Creek, Amador Co. (Contrib. U. S. Nat. Herb 22:89); Goose Creek (hills about headwaters), ne. San Joaquin Co., *Jepson* 18,682; Farmington, San Joaquin Co., *Hoover* 345; Eugene, Stanislaus Co., *Jepson* 18,025; Knights Ferry (3 mi. s.), Stanislaus Co., *Jepson* 18,093 (prickles of nutlets absent except from upper part of dorsal keel); near La Grange, Stanislaus Co., *Hoover* 968 (nutlets as in the preceding).

Near La Grange, Stanislaus Co., occurs a form (var. nuda Hoover) with the nutlets destitute of prickles. This remarkable and instructive form could not so well have been evaluated properly save for the fortune of instituting comparisons with a collection from the same locality (Hoover 968) representing the species, but which is in some respects intermediate between the species and the variety.

Refs.—ALLOCARYA AUSTINAE Greene, Pitt. 1:18 (1887), type loc. Butte Co., *R. M. Austin;* Jepson, Man. 853 (1925). *Echinoglochin austinae* Brand; Fedde, Repert. Sp. Nov. 21:253 (1925). *Plagiobothrys austinae* Jtn., Contrib. Arn. Arb. 3:36 (1932). *A. cristata* Piper, Contrib. U. S. Nat. Herb. 22:89 (1920), type loc. Mokelumne Hill, Calaveras Co., *Blaisdell. Echinoglochin cristata* Brand, l.c. *A. austinae* var. *cristata* Jepson, Man. 853 (1925). Var. NUDA Hoover, Lflts. W. Bot. 1:228 (1936), type loc. La Grange-Snelling road, *Hoover* 967.

20. **A. greenei** Greene. Stems few from the base, erect to diffuse, 5 to 15 inches high; herbage strigulose or somewhat spreading-hispid; leaf-blades linear or oblanceolate, obtuse, ¾ to 2 inches long; racemes loose, bractless or bracteate at base, 1 to 4½ inches long; nutlets broadly ovate, 1 line long, armed with slender barbed prickles arising from a densely whitish-papillate ground; keel of dorsal side (sometimes obscure) set with prickles, the keel of ventral side thin, high, smooth, ending below the middle in a bordered pit or hollow; prickles ¼ to ½ line long, barbed nearly to base, quite distinct at base.

Grassy clay hills, gravelly flats or adobe plains, 50 to 2600 feet: Sierra Nevada foothills from Stanislaus Co. to Shasta Co.; Sacramento Valley; middle and inner North Coast Ranges from Sonoma Co. to western Siskiyou Co. North to southern Oregon. Mar.-June.

Locs.—Sierra Nevada foothills: La Grange, Stanislaus Co., *Hoover* 3418; Willow Springs sta., Amador Co., *Jepson* 15,242; Folsom, e. Sacramento Co., *Jepson* 15,744; near Table Mt., n. of Oroville, *Heller* 11,266. Sacramento Valley: Vanden, cent. Solano Co., *Jepson* 19,905; Peaceful Glen, nw. Solano Co., *Jepson* 9611; Rio Linda, n. Sacramento Co., *Jepson* 16,588; Biggs, Butte Co., *H. F. Copeland;* Red Bluff, *Jepson* 21,174 (exclusively occupying many acres in dry fields). North Coast Ranges: Bennet Valley, Sonoma Co., *M. S. Baker* 2131a; Yreka, *Butler* 668.

Var. **hystricula** (Piper) Jepson. Dorsal side of nutlets thickly prickly, the prickles very short (⅛ to ⅙ line long), crowded in rows or sometimes in interrupted rows and forming complete or imperfect areolae; ventral side of nutlets not prickly, rugulose-tuberculate.—Plains and hills of Solano Co.: Elmira, *K. Brandegee;* Montezuma Hills, *Jepson* 21,176.

Refs.—ALLOCARYA GREENEI Greene, Man. Reg. S. F. Bay 259 (1894); Jepson, Fl. W. Mid. Cal. 443 (1901), ed. 2, 346 (1911), Man. 853 (1925). *Echinospermum greenei* Gray, Proc. Am. Acad. 12:163 (1877), type loc. Yreka, Siskiyou Co., *Greene. Allocarya echinoglochin* Greene, Pitt. 1:15 (1887). *Plagiobothrys greenei* Jtn., Contrib. Gray Herb. 68:76 (1923). *Echinoglochin greenei* Brand; Fedde, Repert. Sp. Nov. 21: 253 (1925). Var. HYSTRICULA Jepson, Man. 853 (1925). *A. hystricula* Piper, Contrib. U. S. Nat. Herb. 22:87 (1920), type loc. Montezuma Hills, Solano Co., *Jepson* 21,176 (isotyp. in Herbario Jepsoniano). *Echinoglochin hystricula* Brand, l.c. *Plagiobothrys hystriculus* Jtn., Contrib. Arn. Arb. 3:32 (1932).

21. **A. acanthocarpa** Piper. Adobe Allocarya. Stems few or several from the base, simple, 4 to 12 inches high; herbage appressed-hispidulose; leaves linear, ¼ to ¾ (or 1¼) inches long; racemes interrupted, elongated; calyx tawny-hirsute; corolla ½ to 1 line broad; nutlets ovate, acute; dorsal side of nutlets reticulate with thin and often high ridges, the ridges and the keel bearing spreading minutely barbed spines, the areolae 1 to 8-tuberculate; ventral side of nutlets keeled from the apex to the pit-like scar, and bearing either side the unarmed naked keel a series of smooth unarmed transverse rugae.

Moist clay or black-adobe flats, less commonly in beds of former winter pools, 5 to 2000 feet: lower Sacramento Valley; South Coast Ranges, mostly towards the interior, from Contra Costa Co. to Monterey Co. and western Fresno Co.; San Joaquin Valley; Sierra Nevada foothills from Mariposa Co. to Kern Co.; Tehachapi Mts.; San Diego Co. and adjacent Lower California. Apr.-May.

Locs.—Lower Sacramento Valley: Montezuma Hills, Solano Co., *Jepson* 21,175. South Coast Ranges: Mt. Diablo, *Bowerman* 1761; Corral Hollow, w. San Joaquin Co., *J. T. Howell* 10,885; Panoche Pass (w. side), *Hoover* 3002; Tres Piños, San Benito Co., *Jepson* 16,119; Jolon, (2 mi. e.), Monterey Co., *Ferris* 8439; Alcalde, sw. Fresno Co., *T. Brandegee.* San Joaquin Valley: Byron, e. Contra Costa Co., *Greene;* Oakdale (7 mi. se.), *Jepson* 18,102; El Nido (n. of, near Deadman's Creek), Merced Co., *Jepson* 17,482; Daulton, Madera Co., *Hoover* 3454; Hildreth Creek (near), 5½ mi. w. of Little Table Mt., Madera Co., *Jepson* 15,154; Mendota (6 mi. s.), w. Fresno Co., *Jepson* 16,937; Goshen, Tulare Co., *K. Brandegee.* Sierra Nevada foothills: near La Grange, Stanislaus Co., *Hoover* 1721; Lewis, Mariposa Co., *Congdon;* Success, Tulare Co., *Keck & Clausen* 3206; Poso Creek, Greenhorn foothills, Kern Co., *C. N. Smith;* Caliente, Kern Co. San Diego Co.: San Marcos, *Cleveland;* San Diego, *Jepson* 6669.

Var. **oligochaeta** (Piper) Jepson. Spines of nutlets reduced, few, sparsely or not at all barbed, or sometimes obsolete.—San Joaquin Valley: Antioch, *Davy* 913; Waterford, Stanislaus Co., *Hoover* 793; Visalia (4 mi. n.), *Hoover* 919. Eastern San Luis Obispo Co.: Carrizo plain, *Condit.*

Refs.—Allocarya acanthocarpa Piper, Contrib. U. S. Nat. Herb. 22:87 (1920), type loc. Caliente, Kern Co., *T. Brandegee;* Jepson, Man. 853 (1925). *Echinoglochin acanthocarpa* Brand; Fedde, Repert. Sp. Nov. 21:253 (1925). *Plagiobothrys acanthocarpus* Jtn., Contrib. Arn. Arb. 3:33 (1932). *A. echinacea* Piper, l.c. 22:88 (1920), type loc. University Heights, San Diego, *T. Brandegee* 825. *Echinoglochin echinacea* Brand, l.c. *A. acanthocarpa* var. *echinacea* Jepson, Man. 853 (1925). *A. eastwoodae* Piper, l.c. 22:89 (1920), type loc. Guernsey, Kings Co., *Eastwood* 3896. *Echinoglochin eastwoodae* Brand, l.c. Var. oligochaeta Jepson, Man. 854 (1925). *A. oligochaeta* Piper, l.c. 22:88 (1920), type loc. San Joaquin Valley, *Greene. Echinoglochin oligochaeta* Brand, l.c. *A. spiculifera* Piper, l.c. 22:90 (1920), type loc. betw. Earlimart and Delano, Tulare Co., *Eastwood* 3939 in part; Jepson, Man. 853 (1925). *Glyptocaryopsis spiculifera* Brand; Engler, Pflzr. 4^{252}:104 (1931). *A. anaglyptica* Piper, l.c., type loc. betw. Earlimart and Delano, Tulare Co., *Eastwood* 3939 in part. *Glyptocaryopsis anaglyptica* Brand, l.c. *A. papillata* Piper, l.c. 22:91 (1920), type loc. Delano, Kern Co., *Eastwood* 3965. *Glyptocaryopsis papillata* Brand, l.c. *Plagiobothrys acanthocarpus* f. *papillatus* Jtn., l.c. 35. (?) *A. microcarpa* Piper, l.c., type loc. Mariposa, *Congdon* 48. *Plagiobothrys piperi* Jtn., Contrib. Gray Herb. 68:75 (1923), new name for the preceding. *Glyptocaryopsis microcarpa* Brand, l.c. 105.

16. **ECHIDIOCARYA** Gray

Annual herbs with alternate leaves, the lowest ones opposite. Flowers in racemes. Nutlets incurved, rugulose-reticulate dorsally; scar elevated on a conspicuous stout cylindric process or stipe. Ventral keel prominent, continuous downward and joined to the base of the stipe.—Species 3, North and South America. (Greek echidion, a diminutive viper, and carua, nutlet, the stipe suggestive of the head and neck of a snake.)

1. **E. californica** Gray. Stems several to many from the base, diffuse or prostrate, mostly slender, often very leafy, 5 to 15 inches long, flowering from near the base; herbage hispid or hirsute; leaf-blades oblong-ovate to linear, ¼ to 1¾ inches long; racemes spike-like, bractless, or sometimes interruptedly bracteate, in age the flowers remote; corolla 1 to 3 lines wide; nutlets usually 4, ovate, ¾ line long, keeled towards apex dorsally, the rugae sometimes delicate, sometimes thin and sharp, and often muriculate or tuberculate; ventral keel high and thin.

Mesas and grassy slopes, 30 to 4000 feet: San Benito Co. to eastern San Luis Obispo Co.; cismontane Southern California from Santa Barbara Co. to San Diego Co. South into Lower California. Apr.-May.

Locs.—South Coast Ranges: Vancouver Pinnacles, San Benito Co. (Lflts. W. Bot. 2:101); Estrella, San Luis Obispo Co., *Jared*. Cismontane S. Cal.: Santa Barbara, *T. Brandegee;* Santa Cruz Isl., *T. Brandegee;* Santa Catalina Isl., *Greata;* San Clemente Isl., *Murbarger* 36; betw. Pine Flats and Chilao, San Gabriel Mts., *Peirson* 997; Temescal Cañon near Twin Sprs., sw. Riverside Co., *Jepson* 19,130; Las Flores, San Diego coast, *Abrams* 3276; San Diego, *Orcutt* 2265; Campo, San Diego Co., *Munz* 12,629.

Var. **ursina** (Gray) Jepson. Stems stout, short, congested; nutlets about 1 line long, the dorsal rugae fewer.—Montane valleys, 3000 to 6700 feet: Bear Valley, San Bernardino Mts., *Parish* 927; Hemet Valley, San Jacinto Mts., *Munz* 5416. South to Lower California.

Refs.—ECHIDIOCARYA CALIFORNICA Gray, Proc. Am. Acad. 12:164 (1877), type loc. "San Bernardino Co." (undoubtedly in the cismontane part of the county), *Parry & Lemmon;* Jepson, Man. 854 (1925). *Plagiobothrys californicus* Greene, Bull. Cal. Acad. 2:407 (1887). *P. californicus* var. *genuinus* Jtn., Contrib. Gray Herb. 68:73 (1923). *Allocaryastrum californicum* Brand; Engler, Pflzr. 4^{252}:100 (1931). *Plagiobothrys cooperi* Gray, l.c. 20:285 (1885), type loc. vicinity of San Diego, *Cooper*. *P. californicus* var. *gracilis* Jtn., l.c., type loc. San Diego, *Brandegee* 1658. *Allocaryastrum gracile* Brand, l.c. *Plagiobothrys californicus* var. *fulvescens* Jtn., l.c. 68:74 (1923), type loc. Santa Barbara, *T. Brandegee* (intermediate toward var. ursina). *Allocaryastrum ursinum* var. *fulvescens* Brand, l.c. 4^{252}:101 (1931). *Plagiobothrys allocaryoides* Brand; Fedde, Repert. Sp. Nov. 20:47 (1924), type loc. San Diego, *Jones* 3072. *Allocaryastrum allocaryoides* Brand; Engler, Pflzr. 4^{252}:100 (1931). Var. URSINA Jepson, Man. 854 (1925). *E. ursina* Gray, l.c. 19:90 (1883), type loc. Bear Valley, San Bernardino Mts., *S. B. & W. F. Parish*. *Plagiobothrys ursinus* Gray, l.c. 20:285 (1885). *P. californicus* var. *ursinus* Jtn., Contrib. Gray Herb. 68:74 (1923). *Allocaryastrum ursinum* Brand; Engler, Pflzr. 4^{252}:101 (1931).

17. **PLAGIOBOTHRYS** F. & M. Pop-corn Flower

Rather slender annuals. Herbage soft-pubescent, the hairs often rusty when young, especially on the calyx. Leaves mostly in a basal rosette, also alternate along the stems, all sessile or if narrowed below broad at base. Flowers subsessile or short-pediceled, borne in racemiform inflorescences but the inflorescences essentially spike-like and here called spikes. Spikes elongated and loose, or sometimes extremely short and dense (the flowers then glomerate). Pedicels persistent. Corolla short, white, with crests or processes at the mouth of the throat. Nutlets ovoid, strongly incurved, keeled dorsally, also keeled ventrally from near the middle to the apex, and often also laterally keeled or margined, the dorsal side usually rugose and often tuberculate or papillate. Nutlets inserted ventrally above the base or at the middle, the scar raised and rounded (caruncle-like and here called a caruncle) and leaving a corresponding depression on the receptacle or gynobase.—Species about 15, North and South America. (Greek plagios, on the side, and bothrus, pit or excavation, the first known species having a hollow scar.)

Caruncle rounded or circular in outline; nutlets ovate or cruciform.

Flowers in elongated spikes; caruncle firm or cartilaginous, borne at or a little below the middle of the nutlet in a transverse groove or hollow, and thus lying below or slightly below the ventral keel; basal rosette of leaves conspicuous; mature nutlets 1 to 4.

Calyx-lobes erect or spreading, not circumscissile; mature nutlets usually 4; midrib and margins of leaves not purple-stained (or purple-stained in nos. 5 and 6 and often in no. 2).

Nutlets transversely ridged dorsally, the ridges regular and parallel, not forming areolae.

Rugae narrow and sharp or roughish, or formed of rows of tubercles, separated by broadish intervals; nutlets brown, ovate, rounded at base, constricted at apex; plants purplish; South Coast Ranges, low altitudes, rare........1. *P. uncinatus.*

Rugae broad and low, flattish, closely packed and separated only by narrow or line-like grooves.

Plants conspicuously purplish; nutlets whitish, orbicular-ovate, constricted only at apex, the base rounded; rugae smooth and polished; Sierra Nevada, middle altitudes........2. *P. torreyi.*

Plants not purplish or rarely so; nutlets strongly constricted at apex and at base, and thus cruciform, vitreous-shining or glassy.

Calyx about twice as wide as long; spikes not bracteate or only at base; stems many from base, slender; cismontane Cal. and transmontane ne. Cal.......3. *P. tenellus.*

Calyx nearly as broad as long; spikes bracteate; stems few, stout; cent. and n. Cal.......4. *P. shastensis.*

Nutlets transversely ridged dorsally, the ridges irregular, well separated and forming (with the 3 keels) depressed areolae, the areolae papillate, the ridges often sharp and thin or sometimes rounded; calyx in fruit 2 to 3 lines long.

Caruncle conspicuous, ring-like or annular, bordering a circular hollow; calyx cleft to the base; corolla-tube exceeding the calyx.

Spikes bractless; dorsal areolae of nutlets rectangular and regular with smooth ridges; keels of nutlet not winged; cent. and n. Cal.......5. *P. fulvus.*

Spikes bracteate; dorsal area of nutlets not areolate or the areolae irregular and unequal with short, curved or interrupted rugae; keels of nutlets narrowly whitish-winged; mostly inner Coast Range.......6. *P. infectivus.*

Caruncle solid; calyx white-hairy, cleft ⅔ to base; corolla-tube not exserted or only slightly exserted from calyx; wide-ranging.......7. *P. canescens.*

Calyx-lobes connivent over fruit, in age circumscissile; calyx in fruit 1 to 1¼ lines long; mature nutlets 1, 2 or 3 (or 4), the caruncle solid; midvein and margin of leaves purple-stained.

Flowers in forked spikes, not bracteate, or only at base; stems mostly erect, rather tall (10 to 30 inches high); nutlets (as seen from the side) somewhat compressed, the dorsal areolae papillate or tuberculate (rarely smooth); wide-ranging.......8. *P. nothofulvus.*

Flowers in long simple bracteate spikes; stems low (5 to 8 inches high), usually ascending; nutlets (as seen from the side) strongly arched, the areolae smooth or minutely papillate; cent. and s. Cal.......9. *P. arizonicus.*

Flowers in close clusters or glomerules; e. side Sierra Nevada.......10. *P. hispidus.*

Caruncle elongated, extending along the ventral keel; nutlets trigonous; flowers mostly in congested glomerules or dense spikes, the glomerules or spikes ¼ to 1¼ inches long; deserts on e. side Sierra Nevada.

Nutlets irregularly rugose; corolla 2 to 3½ lines broad.......11. *P. kingii.*

Nutlets regularly tessellate; corolla ½ to 1 line broad.......12. *P. jonesii.*

1. **P. uncinatus** J. T. Howell. Stem with many branches from the base, forming an erect bushy plant 13 inches high; herbage reddish, thinly spreading-bristly; leaf-blades oblong, 4 to 11 lines long; flowers very remotely scattered along the stems from near the base (or solitary in the axils) and also loosely congested in terminal racemes 2 to 9 lines long; calyx densely uncinate-bristly, destitute of soft hairs; corolla ¼ to ½ line broad; nutlets with somewhat quadratish body, rounded at base and abruptly attenuate at apex, the dorsal side transversely tuberculate-rugulose and weakly keeled towards apex, the ventral side rugulose, the ventral keel thin and rather high.

Cañon sides, 1000 to 1700 feet: Santa Lucia Mts.; Gabilan Range. Apr.-May.

Tax. note.—Two stations have been recorded for Plagiobothrys uncinatus: Arroyo Seco in the Santa Lucia Mts. and Vancouver Pinnacles in the Gabilan Range (Lflts. W. Bot. 2:255). The plant in habit is similar to Plagiobothrys torreyi; in technical characters it is extremely close to P. myosotoides; the nutlets are identical with those of P. myosotoides (as represented by California plants) but the calyx exhibits the remarkable difference of uncinate bristles. Now that this unusual plant has been published, probably it will be searched for successfully. Its status, however, seems dependent on the development of knowledge concerning the very closely allied Plagiobothrys myosotoides. Due to insufficient material, especially from Chile, the ultimate evaluation of these two forms cannot now be predicted.

Refs.—PLAGIOBOTHRYS UNCINATUS J. T. Howell, Lflts. W. Bot. 2:255 (1940), type loc. Santa Lucia Camp, Arroyo Seco, Santa Lucia Mts., *Eastwood & Howell* 2416 (typ. vidi). "Immediately related to" *P. myosotoides* Brand of Chile.—I. M. Johnston, Jour. Arn. Arb. 20:383 (1939).

2. **P. torreyi** Gray. (Fig. 417.) Stems several to many from the base, erect or decumbent, usually simple, 3 to 10 inches long, commonly rather leafy; roots purple; herbage conspicuously spreading-hispid, the leaves very dark green; leaf-blades oblong to oblong-ovate or linear, sessile, 3 to 6 lines long or the lower be-

coming 1 to 1½ inches long and often shortly petioled; spike leafy-bracteate throughout, somewhat loose; corolla 1 to 1½ lines broad; nutlets commonly 4, orbicular-ovate, constricted at apex so as to be shortly acute, ¾ to 1 line long, the dorsal ridge weak or not strongly differentiated, produced over the apex into the thin but prominent ventral keel; dorsal side crowded with low or flattish transverse ridges, whitish and smooth but separated by distinct line-like grooves; lateral angles well-defined; caruncle small, borne in the transverse groove.

Montane meadows and flats, 4000 to 8000 feet: Sierra Nevada from Sierra Co. to Kern Co.; San Bernardino Mts. June-July.

Locs.—Sierra Nevada: Mohawk Creek, Sierra Co., *W. I. Follett* 83; Donner Lake, *Sonne;* Fallen Leaf Lake, Eldorado Co., *Ottley* 820; Deadman Creek, Tuolumne Co., *Jepson* 6560; Lake Eleanor, Tuolumne Co., *A. L. Grant* 1259; Lake Merced, Mariposa Co., *Jepson* 4407; Yosemite, *Jepson* 4258a; Arnold Mdw., Madera Co., *A. L. Grant* 1350; Mono Mdws., Mono Creek, South Fork San Joaquin River, *E. Ferguson* 420; Volcano Creek, Tulare Co., *Hall & Babcock* 5317. San Bernardino Mts., (acc. *P. A. Munz*). The collections above cited, all from rather high altitudes, represent for the most part var. diffusus Jtn., the bracts mostly exceeding the flowers; whereas in the typical form from Yosemite Valley, the bracts are described as mostly shorter than the flowers. A collection from Yosemite Valley (*Jepson* 10,471), as well as other collections from the same region, do not exhibit, however, any uniformity in bract size; the bracts are mostly longer than the flowers, save sometimes in case of the terminal flowers of the raceme. Most collections show the bracts to be variable in size in such wise as to indicate this feature to be of slight significance taxonomically, as is, to be sure, the case generally in the genus. One may consider Plagiobothrys canescens in which bractless racemes or bracted racemes often occur in one collection, frequently, indeed, on one individual.

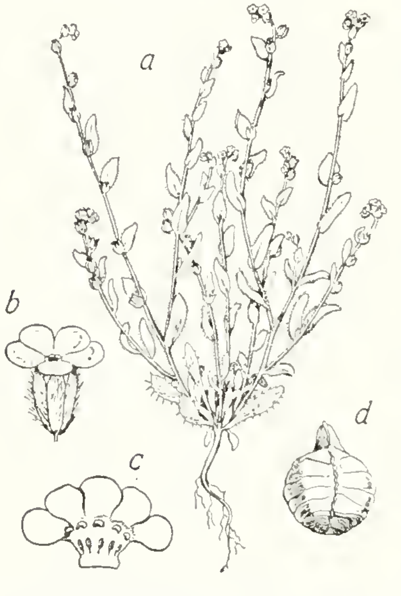

Fig. 418. Plagiobothrys torreyi Gray. *a*, habit, × ½; *b*, fl., × 4; *c*, corolla, spread open, × 4; *d*, nutlet, × 8.

Refs.—Plagiobothrys torreyi Gray, Proc. Am. Acad. 20:284 (1885); Jepson, Man. 855 (1925). *Eritrichium torreyi* Gray, l.c. 10:58 (1874), type loc. Yosemite Valley, *Torrey*. *Cryptantha torreyi* Rydb., Mem. N. Y. Bot. Gard. 1:331 (1900). *P. torreyi* var. *diffusus* Jtn., Contrib. Gray Herb. 68:71 (1923), type loc. Donner Lake, *Heller* 6986; Jepson, Man. 855 (1925).

Plagiobothrys myosotoides Brand; Engler, Pflzr. 4^{252}:108 (1931). *Lithospermum myosotoides* Lehm., Asperif. 319 (1818), type from Peru. *P. torreyi* var. *perplexans* Jtn., Contrib. Gray Herb. 68:72 (1923), type loc. Greenhorn Pass, Greenhorn Mts., Kern Co., *Purpus* 5542. Two California collections (ridge betw. Isabel Valley and Arroyo Bayo, Mt. Hamilton Range, *Helen Sharsmith* 1893; Big Sandy Valley, Black Mt., Fresno Co., *Hoover* 3465) have been referred to this Chilean species by I. M. Johnston (Jour. Arn. Arb. 20:381,—1939) and a third (Greenhorn Pass, Greenhorn Mts., *Purpus* 5542) may be here considered. These plants match closely P. torreyi in size, habit, leafage, pubescence, racemes and flowers. The nutlets are like those of Plagiobothrys torreyi in configuration and in keels and are of about the same size. The differences, as here worked out, appear to be as follows: The rugae of nutlets in Plagiobothrys torreyi are low, broad and flat, separated by shallow line-like grooves; they are smooth, polished, whitish and shining. The rugae of nutlets in Plagiobothrys myosotoides are narrow and acute and separated by broad grooves which are sometimes papillate, or often the rugae consist of rows of tubercles; the rugae are brownish and slightly roughish, not polished or shining. These differences between the two species, if correctly observed differences, are fundamental, but it must be said that of the above-cited collections of Plagiobothrys myosotoides only two have perhaps full-grown nutlets and none have mature nutlets. Dead-ripe fruiting specimens are yet to be collected. Geographically there is a marked distinction: P. torreyi occurs from 4000 to 7500 feet; the above collections of P. myosotoides represent the foothills from 2500 to 3000 feet or sometimes 4500 feet. Although of obvious interest, it is probable that evidence on this problem, morphologic and especially geographic, is yet in the formative stage.

3. **P. tenellus** Gray. Stems 1 to several from the base, slender, commonly erect, simple, or branching only above, arising from a conspicuous basal leaf-rosette, 3 to 7 (or 13) inches high, pubescent and often also spreading-hirsute; leaves ascending-hirsute, those of the basal tuft oblong, $\frac{1}{2}$ to 1 inch long; cauline leaves few, ovate or ovate-oblong, 2 to 7 lines long; spikes rather few-flowered, at length 1 to 3 inches long; calyx deeply cleft, rusty-yellowish, at length pale, sometimes imperfectly circumscissile, its lobes ovate, abruptly attenuate; nutlets somewhat ovoid, abruptly constricted and shortly acute at base and apex, 3-keeled dorsally and also transversely rugose, $\frac{3}{4}$ to $\frac{7}{8}$ line long; rugae straight, flattish or low-rounded, tuberculate and interrupted or often smooth, separated by very narrow or hair-like grooves; lateral angles papillate-scabrous; ventral side of nutlets with the caruncle seated in a transverse central groove or hollow.

Dry open hills and gravelly flats, 20 to 3500 (or 5000) feet; throughout cismontane California; also transmontane northeastern California. East to Arizona and Utah, north to British Columbia. Apr.-May.

Locs.—Cismontane S. Cal.: Santa Ysabel, Cuyamaca Mts., *Jepson* 17,144; Warner Ranch, e. San Diego Co., *Jepson* 8528; Strawberry Valley, Mt. San Jacinto, *Jepson* 1308; Elsinore, sw. Riverside Co., *Jepson* 19,141; Reche Cañon, se. of Colton, *Parish;* Santa Barbara, *T. Brandegee.* Coast Ranges: Bitterwater Valley, betw. Cholame and Annette, San Luis Obispo Co., *Wiggins* 5809; Pacific Grove, *Elmer* 3513; Los Gatos (hills w.), *Heller* 7338; Corral Hollow, Mt. Hamilton Range, *Jepson* 9575; St. Helena, Napa Valley, *Jepson* 21,148; Ukiah, *Bolander* 3826; Redway, near Garberville, *Tracy* 9863; Phillipsville, South Fork Eel River, *Tracy* 5469; Beegum, w. Tehama Co., *Jepson* 16,632; Berry's ranch, Redwood Creek, n. Humboldt Co., *Tracy* 10,070; Yreka, *Butler* 633; Gasquet, Del Norte Co., *R. Van Deventer* 88. Tehachapi Mts.: Rowen, *Jepson* 6722. Great Valley: Antioch, *K. Brandegee;* Rosewood, w. Tehama Co., *Jepson* 21,149. Sierra Nevada: Poso Mine, Greenhorn Mts., *C. N. Smith* 294; Kaweah, North Fork Kaweah River, *Hopping* 251; Little Dry Creek, near Sparkville, Fresno Co., *Jepson* 15,146; Big Sandy Valley, Black Mt., Fresno Co., *Hoover* 3467; North Fork sta., Madera Co., *Bacigalupi* 2251; Bootjack, Mariposa Co., *Jepson* 12,779; La Grange, Stanislaus Co., *Hoover* 1713; Avery, Calaveras Co., *Tracy* 5731; Lotus, Eldorado Co., *Jepson* 18,595; Marston sta., Plumas Co., *Heller* 10,842. Transmontane ne. Cal.: Big Valley near Lookout, Modoc Co., *Baker & Nutting;* Little Shasta, e. Siskiyou Co., *F. W. Hooper.*

Refs.—PLAGIOBOTHRYS TENELLUS Gray, Proc. Am. Acad. 20:283 (1885); Jepson, Fl. W. Mid. Cal. 446 (1901), ed. 2, 348 (1911), Man. 855 (1925). *Myosotis tenella* Nutt.; Hook., Kew Jour. Bot. 3:295 (1851), type loc. Coeur d'Alene River Valley, *Geyer* 290. *P. asper* Greene, Pitt. 3:262 (1898), "northern Cal. to Wash." *P. parvulus* Greene, Pitt. 3:261 (1898), type loc. Castroville, Monterey Co., *Hickman. P. tenellus* var. *parvulus* Jtn., Contrib. Gray Herb. 68:72 (1923). *P. colorans* Greene, Pitt. 3:262 (1898), type loc. Hornbrook, Siskiyou Co., *T. J. Howell* (plants purple-staining). *P. tenellus* var. *colorans* Jtn., l.c. 68:73 (1923). *P. humifusus* Jones, Contrib. W. Bot. 13:7 (1910), type loc. Chat, Lassen Co., *Jones. P. tenellus* var. *parvulus* subvar. *humifusus* Brand; Engler, Pflzr. 4^{252}:108 (1931).

4. **P. shastensis** Greene. Stems erect, one or few from the base, simple or branching above, 5 to 12 inches high; herbage thinly hirsute; leaf-blades linear to lanceolate, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; spikes loose, $\frac{1}{2}$ to 5 inches long, bracteate throughout; calyx 2 to $2\frac{3}{4}$ lines broad, scarcely longer, cleft to the middle; corolla $1\frac{1}{4}$ lines broad, its lobes ascending, $\frac{1}{2}$ line long; nutlets quadratish-ovate and abruptly short-acute, shining-vitreous, 1 to $1\frac{1}{2}$ lines long, the dorsal side 3-keeled, the intervals between the keels shallowly troughed and crowded with transverse very low and flat broad ridges separated by line-like grooves, these grooves sometimes forming a network.

Hillslopes and gravelly flats in valleys, 100 to 2500 feet: Sierra Nevada foothills (and sometimes on the bordering Great Valley plain) from Stanislaus Co. to Butte Co.; inner Coast Range (and sometimes the bordering Great Valley plain) from Merced Co. to Siskiyou Co. North to southern Oregon. An uncommon species. May.

Locs.—Sierra Nevada foothills and bordering Great Valley plain: Merced (10 mi. n., in foothills), *Hoover* 2069; La Grange, Stanislaus Co., *Hoover* 1715; Linden, San Joaquin Co., *Gunnison;* Ione, Amador Co., *T. Brandegee;* Oroville (hills n.), *Heller* 11,267; Chico, *Hoover* 3244; Seven Mile Creek (4 mi. ne. of Red Bluff), Tehama Co., *Jepson* 16,365. Inner Coast Range and bordering Great Valley plain: Pacheco Pass, *Hoover* 4029; Lake Co., *Purpus;* Sites, Colusa Co., *T. Brandegee;* Anderson, Shasta Co., *Alice King.*

Refs.—PLAGIOBOTHRYS SHASTENSIS Greene; Gray, Proc. Am. Acad. 20:284 (1885), type loc. "valley at the base of Mt. Shasta" (probably Shasta Valley), *Greene* in 1876 (he was then at Yreka); Jepson, Man. 855 (1925).

5. **P. fulvus** Jtn. var. **campestris** Jtn. Stems 1 or several from the base, erect and simple or branching only above, 1 to 2 feet high; herbage hispid-hirsute; roots, petioles and midribs of leaves purple-dyed; herbage spreading-hirsute, the stems also puberulent; leaf-blades linear or lanceolate, ½ to 3¼ inches long; spikes very loose and bractless; calyx-lobes nearly distinct, lanceolate, more or less reddish even in age, 2 to 3 lines long in fruit; corolla 1 to 2 lines broad; nutlets usually 4, 1½ lines long, nearly 1 line wide, quadratish-ovate and abruptly short-acute, prominently 3-keeled dorsally, the transverse rugae more or less interrupted and often weak, the areolae finely papillate (or sometimes the spaces between the keels non-rugose and nearly smooth); nutlets dorsally and ventrally somewhat flattish, the sides usually with a small rugose-margined area; median dorsal keel continued over the apex and prominently down the ventral side to the caruncle; caruncle raised and ring-like, bordering a deep circular excavation.

Gravelly soil of open hills and plains, 100 to 1500 feet: Sierra Nevada foothills from Fresno Co. to Butte Co.; Sacramento Valley; middle and inner Coast Ranges from Santa Clara Co. to Colusa Co. North to Oregon. Apr.-May.

Locs.—Sierra Nevada foothills: Piedra, Fresno Co., *Hoover* 3925; Table Mt., Fresno Co., *Jepson* 15,101; La Grange, Stanislaus Co., *Hoover* 3976; Folsom, e. Sacramento Co., *Jepson* 15,743; New York Ravine, Eldorado Co., *K. Brandegee:* Table Mt., n. of Oroville, *Heller* 11,223. Sacramento Valley: Vacaville, *Jepson* 21,147; Putah Creek bluffs, n. English Hills, nw. Solano Co., *Jepson* 21,145; Colusa jct., *K. Brandegee.* Inner South Coast Range: Pacheco Pass; Clayton, Mt. Diablo, *Hall* 1693. Middle and inner North Coast Ranges: Howell Mt., Napa Range, *Tracy* 12,089; Venado (valley above), sw. Colusa Co., *Jepson* 16,258.

Refs.—PLAGIOBOTHRYS FULVUS Jtn., Contrib. Gray Herb. 68:70 (1923). *Myosotis fulva* H. & A., Bot. Beech. 38 (1830), type loc. Concepcion, Chile, *Bridges*. *Eritrichium fulvum* A.DC., Prodr. 10:132 (1846). *P. rufescens* F. & M., Ind. Sem. Hort. Petrop. 2:46 (1836), type from Chile; Linnaea 11: Litt.-Ber. 116 (1837). Var. CAMPESTRIS Jtn., l.c. 70; Jepson, Man. 855 (1925). *P. californicus* Greene, Pitt. 2:231 (1892), "interior of California"; not P. californicus Greene (1887). *P. campestris* Greene, Pitt. 2:282 (1892), new name for P. californicus Greene (1892). *P. rufescens* var. *campestris* Jepson, Fl. W. Mid. Cal. 446 (1901), ed. 2, 348 (1911).

6. **P. infectivus** Jtn. Stems several from the base and diffuse or 1 and erect, 6 to 14 inches high, spreading-hirsute; leaf-blades linear, 1 to 3½ inches long, ascending-hirsute, the midribs and margins purple-stained; spikes at length very loose and 4 to 6 inches long, leafy-bracteate throughout; calyx cleft to the base into ovate-acute lobes, at first rusty-hirsute; corolla a little exserted from calyx, 1 to 1½ lines broad; nutlets 4, ovate, dorsally 3-keeled, the keels and usually the ridges bounding the areolae produced into a thin white narrow wing; dorsal side of nutlets white-tuberculate on a greenish ground and sometimes conspicuously muricate, rarely areolate, the ventral side winged-areolate; lateral sides of nutlet usually with a wing-margined plane area; dorsal keel extended over apex into a ventral keel ending at the median caruncle; caruncle annular, bordering a hollow excavation.

Heavy black adobe of open hills, 300 to 800 feet: inner North Coast Range in Colusa and Yolo Cos.; South Coast Ranges from the inner range in western San Joaquin Co. to the middle range in San Luis Obispo Co. Mar.-Apr.

Geog. note.—Plagiobothrys infectivus is recorded from western Yolo County and also from Colusa County (Jour. Arn. Arb. 20:381), where it was first collected by M. K. Curran, doubtless near Venado (Mountain House), inner Coast Range foothills, in the southwestern part of the county. Thence it extends southward along the inner Coast Range to San Luis Obispo County. This species is only slightly known, both geographically and morphologically, but probably the center of its distribution lies in the foothills on the east side of the Mount Hamilton Range. In any event, here is found the most extreme or well-marked phase of the species morphologically. Plagiobothrys infectivus is obviously related to P. fulvus var. campestris. In P. fulvus var. campestris, the nutlet, 3-keeled dorsally, is generally marked dorsally by regular rectangular areolae. In P. infectivus the 3-keeled nutlet seems essentially different from that of P. fulvus var. campestris. The dorsal keels in P. infectivus are whitish-winged, the wings thin and narrow but prominent. The dorsal areas between the keels are only partially or irregularly areolate with short, curved or scattered rugae, or, more commonly, not areolate at all but unequally tuberculate or muricate. The regular pattern of the dorsal rectangles with smooth ridges in P. fulvus var. campestris is very constant and in contrast to the interrupted, broken or unequal development of the dorsal relief structure in P. infectivus which is so inconstant. To this may be added a summary by R. F. Hoover of the features of P. infectivus differentiating it from P. fulvus, as follows: "(a) plants lower; (b) midribs and margins of leaves conspicuously dark on lower side; (c) plants staining reddish-purple instead of violet; (d) racemes bracteate; (e) the 3 dorsal keels of nutlets thin and fragile." The following collections validate its occurrence in the South Coast Ranges: Corral Hollow, w. San Joaquin Co., *Hoover* 1744; Puerto Cañon, w. Stanislaus Co., *Hoover* 4348; Crow Creek, w. Stanislaus Co., *Hoover* 4319; Tar Cañon, Diablo Range, w. Kings Co., *Hoover* 4279; Black Mt., n. end La Panza Range, San Luis Obispo Co., *Hendrix* 124.

Ref.—PLAGIOBOTHRYS INFECTIVUS Jtn., Jour. Arn. Arb. 20:380 (1939), type loc. lower Hospital Cañon, w. San Joaquin Co., *Hoover* 3067.

7. **P. canescens** Benth. Stems 2 to 5 from or near the base, long and trailing or straggling, rarely erect, simple or branched, ½ to 2 feet long; herbage pale, hirsute; leaf-blades linear to lanceolate, oblanceolate or oblong, ¾ to 2½ inches long; spikes leafy-bracteate nearly throughout or quite bractless above, 3 to 11 inches long; calyx densely hirsute, cleft to below the middle, the lobes broadly lanceolate, in fruit 2 to 3 lines long, erect (rarely depressed-connivent over the nutlets); pedicels short, stubby, persistent, the calyx in age deciduous; nutlets commonly 4, incurved-connivent, orbicular-ovate and abruptly short-acute, sharply rugose-reticulate, 1 line long, the rectangular or quadratish areolae finely papillate, mostly longer transversely, the rugae remotely tuberculate or smooth; lateral angles of the nutlets very distinct.

Low open hills and plains and valley flats, 10 to 3000 feet: Sierra Nevada foothills from eastern Siskiyou Co. to Kern Co.; Great Valley; South Coast Ranges; western Mohave Desert; cismontane Southern California. Mar.-May.

Locs.—Sierra Nevada foothills: Hornbrook, Siskiyou Co., *Howell* 1784; Big Chico Creek, *Heller* 11,226; Placerville, *K. Brandegee;* Ione, Amador Co., *K. Brandegee;* La Grange, Stanislaus Co., *Hoover* 1714; Hornitos, Mariposa Co., *Jepson* 10,700; Barnafee Flat, Middle Fork Kaweah River, *W. Fry* 103; Cottonwood Creek, lower Kern River, *Allison Krames.* Great Valley: Red Bluff, *Jepson* 21,140; Butte Pass, Marysville Buttes, *Jepson* 21,139; College City, Colusa Co., *Alice King;* English Hills, nw. Solano Co., *Jepson* 21,142; Tracy, San Joaquin Co., *C. F. Baker* 2786; Adela, 1 mi. w. of Oakdale, ne. Stanislaus Co., *Jepson* 17,536; Modesto, *Hoover* 291; Berenda, Madera Co., *Davy* 1691; Tipton, Tulare Co., *Jepson* 11.588; McKittrick, Kern Co., *Jepson* 16,238; Bakersfield, *Allison Krames.* South Coast Ranges: Corral Hollow, Mt. Hamilton Range, *Jepson* 9561; Livermore Valley, *Jepson* 21,143; Little Arthur Creek, w. of Gilroy, *Jepson* 9709; Pacific Grove, *Heller* 6726; Cholame Valley, se. Monterey Co., *Jepson* 15,403; Pozo, San Luis Obispo Co., *Jepson* 11,986. Western Mohave Desert: Mohave sta., *Heller* 7758. Cismontane S. Cal.: Purisima Hills, Santa Barbara Co., *Jepson* 12,656; Santa Cruz Isl., *T. Brandegee* 25y; Saugus, n. Los Angeles Co., *Jepson* 19,222; Santa Catalina Isl., *Geo. B. Grant* 996; San Bernardino, *Parish* 1708; Coahuila Valley, sw. Riverside Co., *Jepson* 1474; Warners Ranch, e. San Diego Co., *T. Brandegee.*

Refs.—PLAGIOBOTHRYS CANESCENS Benth., Pl. Hartw. 326 (1849), type loc. "in arenosis vallis Sacramento," *Hartweg* 256 (more exactly, upper Sacramento Valley on the east side; cf. Erythea 5:55); Jepson, Fl. W. Mid. Cal. 447 (1901), ed. 2, 349 (1911), Man. 856 (1925). *Eritrichium canescens* Gray, Proc. Am. Acad. 10:57 (1874). *P. microcarpus* Greene, Pitt. 1:21 (1887), type loc. Butte Co., *R. M. Austin. P. canescens* var. *apertus* Greene, Pitt. 1:21 (1887), type loc. upper San Joaquin Valley plains, *Greene;* Jepson, Man. 856 (1925).

8. **P. nothofulvus** Gray. FOOTHILL SNOWDROPS. Stems slender, 1 to several from the base, erect or suberect, simple or forked only above, 1 to 2½ feet high; roots, margins and midribs of cauline leaves purple-dyed; herbage villous, the hairs reddish when young, especially on the calyx and sometimes on the leaves; spikes in 1s or geminate or ternate, simple or forked, mostly ⅓ to 1½ feet long, bractless or leafy-bracteate only at base; leaf-blades ½ to 3½ inches long, oblong (or oblong-obovate) to lanceolate or linear, 1 to 4 lines wide; calyx cleft to the middle, in fruit 1 to 1¼ lines long, eventually circumscissile below the middle, the upper part falling away and leaving the persistent base as a shallow cup about the nutlets; corolla 1½ to 4 lines broad; nutlets 3 (sometimes 4, 1, or 2), orbicular-ovate, abruptly short-acute, dorsally 3-keeled, the transverse dorsal rugae complete or inter-

rupted but joining the median dorsal keel and lateral keels and thus forming rectangular or irregular areolae; areolae papillate or tuberculate; caruncle seated in the shallow transverse ventral groove.

Grassy fields and hillslopes, 10 to 4000 feet: throughout cismontane and intramontane California; also in the Mohave Desert, but rare. South to Lower California, north to Washington. Mar.-May.

Note on the nutlets.—Attached near the middle on the ventral side, the nutlets of Plagiobothrys nothofulvus are borne nearly horizontally with their shortly acute apices or beaks interlocked over the gynobase. The dorsal side of the nutlets is properly described as rugose-reticulate, since the ridges of the reticula, whether representing the median keel or the transverse rugae, are usually equally developed.

Field note.—Where the San Joaquin River debouches from the Sierra Nevada foothills, a flat-topped hill called Table Mountain rises in the foreground—its summit a level rocky pavement, its slopes nurturing extensive areas of Plagiobothrys nothofulvus. It lies here in the foothills of Fresno County under the one-time forestrally famous uplift of the immediate region, Pine Ridge. Table Mountain affords excellent views in several directions, especially southward along the foothills. The most abundant spring flowering of Plagiobothrys nothofulvus appears in March, the "snow-drop" blossoms enveloping the hills with a glowing drapery for leagues. The rolling valley lying under Table Mountain southward is dominated by this species,—ribbons and streamers and patches of it extending from the main leagues-wide colony over the thinly wooded hills everywhere. This scene is repeated, a little earlier or a little later, in numerous districts throughout the Sierra Nevada foothills for hundreds of miles and south to the Cuyamaca Mountains of eastern San Diego County. Of the various species of Plagiobothrys in California, this one is, perhaps, the most abundant. It is, in consequence, of some importance as a range plant, since cattlemen call it good stock feed and sheepmen claim that sheep are fond of it—especially when it is young or coming into flower.—Jepson Field Book, 49:79 (March 27, 1929), ms.

Locs.—Coast Ranges: Yreka, *Butler* 694; Paskenta (6 mi. w.), w. Tehama Co., *Virginia Bailey;* Look Prairie, Bull Creek, *Constance* 617; Mail Ridge, Humboldt Co., *Jepson* 1905; Bell Springs Ridge, n. Mendocino Co., *Jepson* 2202; Pine Peak, Vaca Mts., *Jepson* 21,153; St. Helena, Napa Valley, *Jepson* 21,158; Berkeley Hills, *Jepson* 21,151; Mt. Diablo, *Jepson* 9878a; Mt. Hamilton, *Jepson* 4193; Parkfield, se. Monterey Co., *Jepson* 16,173; San Luis Obispo, *Summers.* Great Valley: Salt Creek, w. Tehama Co., *Jepson* 21,152; Rio Linda, n. Sacramento Co., *Jepson* 16,573; Vacaville, *Jepson* 21,160; Merced, *Buckminster.* Sierra Nevada foothills: near Table Mt., n. of Oroville, *Heller* 11,283; Penn Valley, w. Nevada Co., *Jepson* 21,157; Spanish Ravine, Placerville, *Jepson* 18,606; Gwin Mine, Calaveras Co., *Jepson* 1804; Phoenix Lake, near Sonora, *A. L. Grant* 60a; La Grange, Stanislaus Co., *Hoover* 1711; Bootjack, Mariposa Co., *Jepson* 12,782; Little Dry Creek near Sparkville, Fresno Co., *Jepson* 15,145; Orosi (e. of), Tulare Co., *H. P. Kelley;* Olcese Ranch, lower Kern River, near Cottonwood Creek, *Allison Krames.* Tehachapi Mts.: Bena sta., Caliente foothills, *Jepson* 11,610; Keene, *Jepson* 7158. Mohave Desert: Bailey road sta., w. Antelope Valley, *Hoover* 3116. Cismontane and intramontane S. Cal.: Los Alamos, Los Alamos Valley, *Jepson* 8448; Santa Barbara, *T. Brandegee* 25x; San Bernardino, *Parish* 25y; Cootea Valley, Palomar Mt., *Jepson* 1526; Santa Ysabel, Cuyamaca Mts., *Jepson* 8524; Julian, *Jepson* 17,137; San Pasqual Valley, cent. San Diego Co., *Jepson* 19,166; La Mesa, w. San Diego Co., *Jepson* 6690.

Refs.—PLAGIOBOTHRYS NOTHOFULVUS Gray, Proc. Am. Acad. 20:285 (1885); Jepson, Fl. W. Mid. Cal. 447 (1901), ed. 2, 349 (1911), Man. 856 (1925). *Eritrichium nothofulvum* Gray, l.c. 17:227 (1882), new name for Myosotis fulva H. & A., Bot. Beech. 369 (1840), not Myosotis fulva H. & A., l.c. 38 (1830). *P. laxus* Greene in Baker, West. Am. Pl. 2:16 (1903), type loc. Lakeport, Lake Co., *C. F. Baker* 3065, nomen nudum.

9. **P. arizonicus** Greene. Stems several from the base, usually simple, erect or usually ascending, commonly 5 to 8 inches high; herbage hispid with spreading hairs; leaf-blades linear-lanceolate to linear, ½ to 1 inch long; roots, midribs and margins of leaves purple, or occasionally the whole plant purplish; spikes elongated, 2 to 6 inches long, remotely flowered, mostly naked above; calyx cleft nearly halfway to base, the oblong lobes connivent over the fruit, the lower portion at length circumscissile near base; corolla 1 to 1¼ lines broad; nutlets 2 (sometimes 1, 3 or 4), ovoid and abruptly short-acute, ¾ to 1¼ lines long, the transverse parallel rugae of the dorsal side joined to the median keel and lateral keels, thus setting off rectangular areolae, or the transverse rugae sometimes interrupted or obscure; keels often tuberculate; areolae smooth or minutely papillate-dotted; caruncle seated in a transverse groove and thus sunken below the crest of the ventral keel.

Dry sandy hillslopes or plains, 100 to 4000 feet: inner South Coast Range; San Joaquin Valley from Merced Co. to Kern Co.; Tehachapi Mts.; southern Sierra

Nevada in Kern Co.; Inyo Co.; Mohave Desert; mountains of eastern San Diego Co. East to New Mexico, south to Mexico. Mar.-May.

Locs.—Inner South Coast Range: Corral Hollow, Mt. Hamilton Range, *Hoover* 3038; Alcalde, sw. Fresno Co., *T. Brandegee.* San Joaquin Valley: Chowchilla, Merced Co., *Hoover* 4011; Kerman, Fresno Co., *Hoover* 1769a; Bakersfield, *Jepson* 6766. Tehachapi Mts.: Keene, *MacFadden* 96o. Sierra Nevada in Kern Co.: Weldon, *Voegelin* 61. Inyo Co.: Olancha, *T. Brandegee.* Mohave Desert: Lancaster, *Jepson* 17,050; Willow Sprs. (cove below), Old Dad Mts., *Jepson* 20,434; Hole-in-the-Wall, Providence Mts., *Jepson* 18,324. Mts. of e. San Diego Co.: Santa Ysabel Valley, *Orcutt* 2262; Mason Valley, *Jepson* 8716.

Var. **catalinensis** Gray. Calyx more open, the lobes less connivent above the nutlets.—Santa Catalina Isl.; San Clemente Isl. (Bull. S. Cal. Acad. 24:50).

Refs.—PLAGIOBOTHRYS ARIZONICUS Greene; Gray, Proc. Am. Acad. 20:284 (1885); Jepson, Man. 856 (1925). *Eritrichium canescens* var. *arizonicum* Gray, l.c. 17:227 (1882), type from Ariz., *Greene.* Var. CATALINENSIS Gray, Syn. Fl. ed. 2, 2:431 (1886), type loc. Santa Catalina Isl., *Lyon. P. canescens* var. *catalinensis* Jepson, Man. 856 (1925). *P. catalinensis* Mcbr., Proc. Am. Acad. 51:546 (1916).

10. **P. hispidus** Gray. Stem diffusely much-branched, 3 to 7 inches high; herbage spreading-bristly; leaf-blades lanceolate to oblong, ½ to 1 inch long; spikes reduced to close glomerules borne at the ends of the branches or in the axils, the glomerules 2 to 6 lines long; corolla ½ line wide; nutlet 1, broadly ovoid with shortly acute inturned apex, 3-ribbed on back or the ribs sometimes obscure, thickly tuberculate and sometimes interruptedly rugulose or short-rugulose; caruncle set ventrally above middle of nutlet under the incurved apex.

Gravelly soil or sandy ground of flats, (3500 or) 5000 to 9000 feet: east and north side of the Sierra Nevada from Mono Co. to eastern Siskiyou Co. Extending to western Nevada and north to eastern Oregon. June-Aug.

Tax. note.—The nutlet of Plagiobothrys hispidus is unlike that in any other of our species. It is in a marked degree borne horizontally, a position associated with the position of the scar above the middle of the nutlet. Dorsally the nutlet is 3-ribbed with the median rib the stronger. Between the ribs lie shallowly troughed intervals. The surface of the nutlets, both dorsally and ventrally, is irregularly and rather finely tuberculate on a microscopically papillate ground.

Locs.—Mammoth, w. Mono Co., *K. Brandegee;* Cottonwood Creek, Sweetwater Mts., *Hoover* 5541; Hot Creek, below Fales Hot Sprs., Mono Co., *Hoover* 5447; Lake Tahoe (n. end), *H. F. Copeland;* Truckee, *Sonne* 397; Donner Lake, *Heller* 6874; Pine Creek, Lassen Co., *M. S. Baker;* Sisson, Siskiyou Co., *Condit.*

Refs.—PLAGIOBOTHRYS HISPIDUS Gray, Proc. Am. Acad. 20:286 (1885), type loc. Truckee, *Curran;* Jepson, Man. 856 (1925). *Sonnea hispida* Greene, Pitt. 1:22 (1887).

11. **P. kingii** Gray. Stems 1 or several from the base, erect or ascending, branched, 4 to 13 inches high; herbage spreading-bristly; leaves ½ to 2½ inches long, the basal linear-oblanceolate, the upper linear or lanceolate; flowers glomerate in short spikes, the spikes ¼ to ¾ inch long or becoming somewhat elongated; corolla 2 to 3½ lines broad; nutlets 4, ovate-cuneate, shortly and somewhat obscurely acute and incurved at apex, the median and lateral ribs little stronger than the transverse rugae, the rugae more or less interrupted but enclosing broad irregular areolae, the areolae finely papillate; dorsal side of nutlet convexly curved from base to apex.

Sandy desert valleys, 3500 to 6500 feet: Inyo Co. East to Utah, north to eastern Oregon. May-June.

Locs.—Northern Inyo Co. (acc. *P. A. Munz*). Nev. (Esmeralda Co.): Pinchot Creek, White Mts., *Duran* 3259.

Var. **harknessii** (Greene) Jepson. Median ridge on ventral side like a thin vertical plate, lying in a groove, the elongated caruncle crowning the lower part of it.—Inyo Co. (Owens Lake, *T. Brandegee*), Mono Co. (Mono Lake) and north to e. Sierra Co. (Bot. Gaz. 62:143). Extending to western Nev. (Palmetto Mts., Esmeralda Co., *Purpus* 5865) and north to eastern Ore. (Desert Well, *Leiberg* 403).

Refs.—PLAGIOBOTHRYS KINGII Gray, Proc. Am. Acad. 20:28 (1885). *Eritrichium kingii* Wats., Bot. King 243, t. 23, figs. 3–5 (1871), type loc. Truckee Pass, Virginia Mts., w. Nev., *Watson.* Var. HARKNESSII Jepson, Man. 856 (1925). *Sonnea harknessii* Greene, Pitt. 1:23 (1887), type loc. Mono Lake, *Harkness. P. harknessii* Nels. & Mcbr., Bot. Gaz. 62:143 (1916).

12. **P. jonesii** Gray. Stems 1 or few from the base, erect but divergently branching, 5 to 12 inches high; herbage spreading-bristly and also finely pubescent with short mostly deflexed hairs; bristles mostly arising from a siliceous base or disk; leaf-blades ¾ to 3 (or 5) inches long, the basal linear-oblanceolate or linear, the cauline lanceolate; spikes moderately dense, ¼ to 1¼ inches long, subtended by mostly conspicuous leafy bracts; calyx-lobes linear; corolla ½ to 1 line broad; nutlets 2 or 3, contorted-pyramidal, 1½ lines long, strongly ridged dorsally and also at the lateral angles, the surface densely crowded or tessellate with unequal several-sided flat tubercles, resembling a cobble-stone pavement; tubercles densely and microscopically papillate; ventral keel well developed, merged below with the low narrow caruncle.

Gravelly soil of desert washes and detrital fans, 3000 to 5700 feet: Inyo Co.; eastern Mohave Desert. East to Arizona. Apr.-May.

Locs.—Inyo Co.: Black Cañon, White Mts., *Duran;* Argus Range (n. end), *Jepson* 19,560a; Hanaupah Cañon, Panamint Range, *Jepson* 7083. Eastern Mohave Desert: Newberry Mts. (Bull. S. Cal. Acad. 24:50).

Refs.—PLAGIOBOTHRYS JONESII Gray, Syn. Fl. ed. 2, 2:430 (1886), type loc. Needles, *Jones;* Jepson, Man. 856 (1925). *Sonnea jonesii* Greene, Pitt. 1:23 (1887).

18. **HARPAGONELLA** Gray

Small annual. Flowers minute, white, racemosely disposed along the branches. Calyx-lobes in flower slightly unequal, 3 nearly distinct, the other 2 united ¾ their length, the united portion bearing on the back a cluster of 5 to 9 soft spines; calyx-lobes in fruit very unequal. Corolla subrotate, slightly exceeding the calyx. Nutlets mostly 2, oblong or ovate, smooth, basally attached, one naked, ascending-hirsutulose and usually infertile, the other fertile, glabrous or nearly so, completely enclosed by the two united lobes of the calyx, the whole calyx becoming in fruit bur-like with its spines diverging, rigid, thick and beset with short bristles hooked at tip.—Species 1. (Diminutive of Latin harpago, a grappling hook.)

1. **H. palmeri** Gray. Stem with few to several diffuse branches from or near the base, the branches 3 to 8 inches long; herbage thinly strigose-hirsute; leaf-blades narrowly linear or very narrowly lanceolate, ½ to 1½ inches long; flowers 1 line long, on short pedicels which in fruit become strongly recurved and rigid.

Dry slopes in the hills and clay depressions on the mesas, mostly at scattered stations, 200 to 1500 feet: coastal Southern California from Santa Catalina Isl. and Riverside Co. to San Diego Co. East to Arizona, south to Lower California. Apr.-May.

Locs.—Santa Catalina Isl., *Grant & Wheeler* 540; Murietta (5 mi. ne.), sw. Riverside Co., *Munz & Johnston* 5335a; Dehesa School, Sweetwater Valley, *Gander* 5072; Otay, near San Diego, *Gander* 3112; Box Cañon, Mason Valley, e. San Diego Co., acc. *F. F. Gander.* "In southwestern San Diego Co. Harpagonella palmeri, recorded from 21 different stations, is not rare."—F. F. Gander.

Refs.—HARPAGONELLA PALMERI Gray, Proc. Am. Acad. 11:88 (1876), type loc. Guadalupe Isl., L. Cal., *Palmer;* Jepson, Man. 857 (1925).

VERBENACEAE. VERBENA FAMILY

Ours perennial herbs (one species a shrub) with opposite or whorled simple leaves. Flowers complete. Calyx persistent. Corolla in ours with a tube, the 4 or 5-lobed limb almost regular or manifestly 2-lipped. Stamens 4, in 2 pairs. Ovary superior, not divided, 2 to 4-celled, becoming a schizocarp and separating at maturity into as many 1-celled 1-seeded achene-like nutlets; style single, entire; stigmas 2 or 1. Nutlets usually rounded and often reticulate on back, the face with a commissural scar or area of coherence. Endosperm scanty or none.—Genera 73, species about 700, all continents.

Of Californian Verbenaceae a collection of specimens has been determined for the use of this work by H. N. Moldenke. His research work in this family has, however, been completely interrupted by the current world catastrophe. Since his monographs on the genera represented in California are incomplete and unpublished it is not now possible to interpret fully his determinations, nor is it desired to anticipate his findings.

Bibliog.—Briquet, J., Verbenaceae (Engler & Prantl, Nat. Pflzfam. 4^{3a}:133–182, figs. 54–68,—1897). Perry, L. M., Revision of the N. Am. species of Verbena (Ann. Mo. Bot. Gard. 20:239–362,—1933). Moldenke, H. N., Verbenaceous novelties (Am. Mid. Nat. 24:750–754,—1940).

Calyx 5-toothed; corolla only slightly 2-lipped; nutlets 4; diffuse or erect herbs........1. VERBENA.
Calyx 2-cleft; corolla markedly 2-lipped; nutlets 2; creeping herbs or erect shrubs........2. LIPPIA.

1. VERBENA L. VERVAIN

Erect or diffuse herbs. Flowers in terminal bracteate spikes. Calyx narrow, tubular, plicately 5-angled, 5-toothed. Corolla salverform, the limb 5-lobed, obscurely or slightly 2-lipped. Anthers ovate. Ovary 4-celled, 1 ovule in each cell. Stigma mostly 2-lobed, the anterior lobe larger and stigmatic, the posterior smooth and sterile. Fruit mostly enclosed by the calyx, finally separating into 4 nutlets; nutlets dorsally 2 to 4-striate, the striae tending (more or less) to form reticulations, especially on upper part; ventral side (or commissure) 2-planed or 2-faced or the commissure much reduced and presenting but one face.—Species about 80, all continents. (Latin name of a sacred plant.)

Note on duration.—As to duration of our native species, Verbena lasiostachys is undoubtedly perennial. Likewise, there can be no doubt that Verbena robusta is perennial in some localities and perhaps in all. The root-crown of Verbena bracteata is thickened in such a manner as to indicate perennial duration. Verbena bipinnatifida var. goodingii flowers the first season but it is often perennial—convincingly so at certain stations in the Providence Mountains. Probably all our species of Verbena, native and introduced, are perennial.

Tax. note.—The nutlets of all the species of Verbena described below are trigonous, that is, the commissure is 2-faced save in one species. In Verbena brasiliensis the commissure is plane or 1-faced.

Flowers in spikes; calyx equaling or a little exceeding the fruit; corolla 1½ to 2 lines long, its limb ½ to 1 (or 2) lines broad; anthers not bearing appendages; sterile style-lobe not exceeding or usually not exceeding the stigmatic lobe.

Spikes rather short, very dense, parallel and erect in a close compact cyme; cent. Cal............... 1. *V. bonariensis.*

Spikes mostly elongated, loosely paniculate.

Bracts shorter than the flowers.

Spikes rather slender, the flowers or fruit discrete or somewhat scattered or remote; coastal S. Cal. and Colorado Desert.

Leaves pinnatifid or unequally incised; nutlets 1½ to 2 times as long as broad.... 2. *V. menthaefolia.*

Leaves serrate; nutlets thrice as long as broad..................................3. *V. scabra.*

Spikes rather thickish, densely flowered, at least above; plants erect.

Petioles not margined; spikes subsessile or shortly peduncled, not leafy-bracteate, numerous in a close or dense panicle; river margins or delta swamps..4. *V. hastata.*

Petioles cuneately margined; spikes mostly peduncled, leafy-bracteate at base, borne in a mostly open panicle; hill country.

Spikes at length 4 to 12 inches long (much elongating), 1½ to 3 lines wide, loosely paniculate; flowers in age a little discrete; throughout cismontane Cal.; common......................................5. *V. lasiostachys.*

Spikes 1 to 3 inches long (only slightly elongating), 3 lines wide, borne in a strict compact panicle; flowers dense; Coast Ranges and coastal S. Cal.; infrequent..6. *V. robusta.*

Bracts exceeding or at least equaling the flowers; spikes thick and dense; plants diffuse or ascending; cent. and S. Cal..7. *V. bracteata.*

Flowers in a head or oblong spike; corolla 4 to 5 lines long, its limb 3 to 5 lines broad, the lobes obcordate; anthers of the upper pair of stamens bearing a glandular appendage; sterile style-lobe exceeding the stigmatic style-lobe; e. Mohave Desert...........8. *V. bipinnatifida.*

1. **V. bonariensis** L. Stem erect, unbranched below, 1½ to 6 feet high, nearly glabrous; leaf-blades oblong-lanceolate, incised-serrate, 2½ to 4½ inches long,

sessile, scaberulous; spikes dense, purplish towards apex, ¾ to 1½ inches long, shortly peduncled or sessile, closely erect in capitately-umbellate clusters, or the clusters somewhat paniculate; bracts lanceolate, acuminate, hairy; corolla lavender, ½ line broad; commissural faces of nutlets densely set with whitish strongly bulbous acute strigillae.

Moist hillsides, river bottoms or flooded valley flats, 60 to 200 feet: introduced from South America, adventive at scattered stations in central California. July-Aug.

Locs.—Near Snelling, Merced Co. (Lflts. W. Bot. 1:21); betw. Alto and Mill Valley, Marin Co. (Lflts. W. Bot. 1:21); Collinsville, Solano Co. (Lflts. W. Bot. 1:21); Marysville, *Jepson* 16,759.

Ref.—VERBENA BONARIENSIS L., Sp. Pl. 20 (1753), "in agro Bonariensi," that is, Buenos Aires, Argentina.

VERBENA LITORALIS H. B. K., Nov. Gen. et Sp. 2:276, pl. 137 (1817), type loc. seashore "prope Truxillo, Santa et Lima," Peru. *V. hansenii* Greene, Pitt. 3:308 (1898), type loc. Sierra Nevada foothills in Amador Co., *Hansen*. Bracts lanceolate, acuminate, nearly equaling calyx; calyx subtruncate, the teeth minute, subulate; corolla 1 to 1¼ lines broad; nutlets striate on the back, the commissure 2-faced, densely covered with minute white stellately toothed scales.—Native of Mexico and South America, introduced into the s. United States and also once collected at Clinton, Amador Co. (*Hansen* 2025, det. L. M. Perry).

VERBENA BRASILIENSIS Vell., Fl. Flum. 1: t. 90 (1790), type from Brazil. Similar to V. litoralis; commissure of nutlets plane, minutely scaberulous, the dorsal side with 5 longitudinal ribs.—Native of Brazil, adventive in the lower San Joaquin Valley: Bouldin Isl., *Congdon* (det. H. N. Moldenke); Modesto, *Hoover* 93 (det. H. N. Moldenke).

2. **V. menthaefolia** Benth. Stems several to many from the base, branching, ascending, 1½ to 2 feet high, thinly hirsutulose, or subglabrous and hirsute on the angles; leaf-blades ovate to oblong, unequally incised to pinnatifid, ¾ to 3 inches long, drawn down to a short margined petiole or subsessile; spikes slender, 4 to 12 inches long, thinly strigulose, the flowers discrete or at least not densely crowded; bracts ovate-lanceolate, acuminate, hirsutulose; calyx hirsutulose, its teeth minute, at maturity connivent over the apex of the fruit and nearly concealing it; corolla-tube equaling or slightly exceeding calyx, its limb 1½ to 2 lines broad; commissural face of nutlets rough-puberulous.

Mesas and flats, 50 to 1000 feet: Sierra Nevada foothills in Tulare Co.; San Diego Co.; Colorado Desert. South to Mexico. Apr.-May.

Locs.—Kaweah, Tulare Co., *K. Brandegee;* San Diego, *G. W. Dunn;* Otay (4 mi. e.), *Wolf* 2100; Indian Wells, Colorado Desert, *T. Brandegee.*

Refs.—VERBENA MENTHAEFOLIA Benth., Pl. Hartw. 21, 33 (1840), type loc. Leon, Mexico, *Hartweg* 175. *V. officinalis* Wats., Bot. Cal. 2:478 (1880); Jepson, Man. 858 (1925); not L.

3. **V. scabra** Vahl. Stem erect, branching, 1 to 3 feet high; herbage hispidulose or scaberulous; leaf-blades ovate to ovate-lanceolate, 1 to 3 inches long, serrate or sparingly incised (or the broadly cuneate base entire), sessile by a broad base or very shortly petioled; spikes very slender, somewhat dense, 2 to 4 inches long; calyx scaberulous; corolla ½ line wide; fruit divergent from axis of spike; commissural faces of nutlets whitish-puberulent.

Marshes or moist places, 10 to 1000 feet: valleys of coastal Southern California bordering or near the foothills of the San Gabriel and San Bernardino mountains. East to North Carolina and Texas, south to Mexico; West Indies. Sept.-Oct.

Locs.—Newport Lagoon, Orange Co., *Booth* 1334; Los Angeles River near Los Angeles, *Braunton* 532; San Bernardino, *Parish.*

Refs.—VERBENA SCABRA Vahl, Ecolog. Am. 2:2 (1798). *V. urticifolia* Jepson, Man. 858 (1925); not L. *V. polystachya* Jepson, l.c.; not H. B. K.

4. **V. hastata** L. BLUE VERVAIN. (Fig. 419.) Stem erect, strict, unbranched below, 2 to 6 feet high; herbage hispidulose; leaf-blades ovate- to oblong-lanceolate, obtuse at base, gradually acuminate to apex, rather finely serrate, 3 to 6 inches long, on petioles 6 to 10 lines long; spikes not leafy at base, more or less

peduncled, densely flowered, 1 to 5½ inches long, erect and numerous in a close umbellate panicle; bracts subulate, shorter than the flowers; corolla deep blue, 1 line broad; commissural faces of nutlets smooth or minutely and closely puberulent.

Marshy islands and river banks, 5 to 3300 feet: delta of the lower Sacramento and lower San Joaquin rivers; Shasta Co.; Humboldt Co. North to British Columbia, east to Nova Scotia and Florida. July-Nov.

Locs.—Delta region: Middle River, San Joaquin Co., *Jepson* 5693; Sherman Isl., San Joaquin Co., *Jepson* 10,215; Grand Isl., Sacramento Co., *Jepson* 21,229. Shasta Co.: Fall River Lake, *M. S. Baker.* Humboldt Co. (Bot. Cal. 2:478).

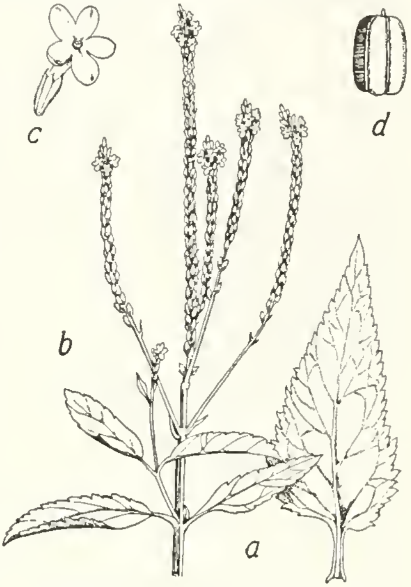

Fig. 419. VERBENA HASTATA L. *a,* leaf, × ⅓; *b,* infl., × ⅓; *c,* fl., × 2; *d,* nutlet, × 4.

Refs.—VERBENA HASTATA L., Sp. Pl. 20 (1753), type loc. "in Canadae humidis"; Jepson, Man. 858 (1925).

5. **V. lasiostachys** Link. CALIFORNIA VERVAIN. (Fig. 420.) Stem erect or diffusely branched and spreading, 1 to 4 feet high; herbage mostly soft-pubescent or spreading-hispid; leaf-blades broadly ovate or oblong-ovate, 1¼ to 4 inches long, coarsely serrate, and often laciniately lobed, especially toward the base which is contracted into the cuneately winged petiole ½ inch long; blades of lower leaves commonly 3-parted or -divided; spikes 2 to 12 inches long, loosely paniculate; bracts subulate, shorter than the calyx; calyx rim with the teeth subulate, minutely bristly, ½ line long; corolla violet or blue, ¾ to 2 lines broad; commissural faces of nutlets minutely dotted-puberulent.

Dry open hillsides and dry or wet flats in the valleys, 150 to 2500 (or 4000) feet: cismontane southern California from San Diego Co. to Santa Barbara Co.; Coast Ranges from San Luis Obispo Co. to western Siskiyou Co.; Sierra Nevada foothills from Tulare Co. to eastern Siskiyou Co. North to Oregon. June-Aug.

Locs.—Coastal S. Cal.: Valley Center, San Diego Co., *C. V. Meyer* 240; Palomar Mt., *Esther Hewlett* 51; near Newport Beach, Orange Co., *Booth* 1171; San Bernardino, *Parish;* San Antonio Cañon, San Gabriel Mts., *Peirson* 175; Los Angeles, *Elizabeth Palmer;* San Marcos ranch, Santa Ynez River Valley, *Jepson* 12,144. Coast Ranges: San Luis Obispo, *Summers;* Cañon del Rey, Monterey, *Jepson* 9738; Alexander Valley, Sonoma Co., *Jepson* 9486; Mt. Konocti, Lake Co., *Jepson* 21,227; Ukiah Valley, *Jepson* 9279; Bartlett Sprs., n. Lake Co., *Jepson* 18,935; South Fork Eel River near Piercy, *Tracy* 5059; Dyerville, Humboldt Co., *Constance* 660; Yreka, *Butler* 943. Sierra Nevada: Hospital Rock, Middle Fork Kaweah River, *W. Fry* 333; Nigger Gulch, Columbia, Tuolumne Co., *Jepson* 6419; Morley sta., Shasta Co., *M. S. Baker;* betw. Sims and Sisson, upper Sacramento River, *Jepson* 21,226.

Var. **abramsii** (Moldenke) Jepson comb. n. Calyx rim with very short obscure lobes or minutely erose.—San Diego Co., San Bernardino Valley (*Parish,* det. H. N. Moldenke) and north to Monterey Co., the Great Valley and Inyo Co., acc. H. N. Moldenke.

Refs.—VERBENA LASIOSTACHYS Link, Enum. Hort. Berol. 2:122 (1822), a garden plant cultivated from California, probably originally collected by Menzies; not V. prostrata Savi (1801). *V. prostrata* R. Br.; Ait., Hort. Kew. ed. 2, 4:41 (1812), type loc. "Northwest Coast of America" (a geographic term which from 1790 to 1840 was sometimes inclusive of California), *Menzies;* Jepson, Man. 858 (1925). *V. lasiostachys* var. *scabrida* Moldenke, Am. Mid. Nat. 24:753 (1940), type loc. Monterey, *Parish* 11,590; mature leaves scabridous above (ex char.). *V. lasiostachys* var. *septentrionalis* Moldenke, l.c., type loc. Medford, Ore., *Epling* 5445; calyx only 3.4 mm. long (ex char.). Var. ABRAMSII Jepson. *V. abramsii* Moldenke, Am. Mid. Nat. 24:750 (1940), type loc. "Hot Springs," San Diego Co., *Palmer* 309.

6. **V. robusta** Greene. Stem strictly erect, paniculately branched above, 2 to 2¾ feet high; herbage hispidulose; leaf-blades ovate in outline, irregularly incised or cleft (but commonly not divided), 1 to 1¾ inches long, rather abruptly and shortly petioled; spikes dense, 1 to 3 inches long, 3 lines broad, disposed in a compact panicle, the panicle a little bracteate-leafy below; bracts lanceolate, acuminate, as long as calyx; corolla 2½ to 3 lines long, its limb 1 line broad, its tube hairy inside; commissure of nutlets densely set with minute erect cylindric processes.

Dry hills or flats, 25 to 1000 feet: Coast Ranges from Solano and Sonoma Cos. to San Luis Obispo Co.; coastal Southern California. South to Lower California. July-Oct.

Locs.—Coast Ranges: Sweeney Creek, nw. Solano Co., *Jepson* 20,250; Kenwood, Sonoma Co., *Davy* 865; Tiburon, Marin Co., *Jepson* 21,230; Wildcat Cañon, Berkeley Hills, *Robt. Brandt;* Leona, Oakland Hills, *Michener & Bioletti;* Coyote Hills, sw. Alameda Co., *Jepson* 12,935; Crystal Springs Lake, San Mateo Co., *Elmer* 4950; Mustang Ridge, near Priest Valley, se. Monterey Co., *Belshaw* 2731; San Luis Obispo, *Condit.* Coastal S. Cal.: Santa Cruz Isl., *Thacher;* Santa Catalina Isl., *Toumey;* San Clemente Isl., *Murbarger* 218; Flinn Sprs., San Diego Co., *Epling.*

Refs.—VERBENA ROBUSTA Greene, Pitt. 3:309 (1898), type loc. Pt. Isabel, Berkeley, *Greene;* Jepson, Man. 859 (1925).

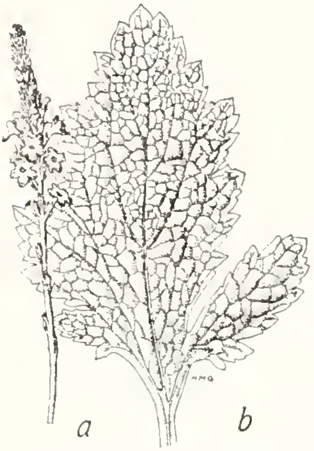

Fig. 420. VERBENA LASIOSTACHYS Link. *a*, spike; *b*, leaf. × ⅔.

7. **V. bracteata** Lag. & Rodr. Stems several from base, branching, ascending or diffuse, 3 to 15 inches long; herbage hispid and hispidulose; leaf-blades obovate or oblong, pinnately incised or coarsely serrate, ½ to 1 inch long, narrowed at base into a cuneately winged petiole ⅓ to ½ as long; spikes commonly dense, 1 to 2 (or 5) inches long; bracts lanceolate, carinate-ribbed, rigid, exceeding the flowers; corolla blue, ½ line wide, the anthers unequally inserted in pairs in upper part of tube, subsessile; commissural faces of nutlets densely set with strongly bulbous strigillae, the strigillae unequal, acute.

Open hills and flats, 50 to 4000 feet: Inyo Co.; San Joaquin Valley; inner South Coast Range; western Mohave Desert; coastal Southern California; Colorado Desert. North to British Columbia, east to Maine and Florida, south to northern Mexico. June-Sept.

Locs.—Inyo Co.: Lone Pine (Contrib. U. S. Nat. Herb. 4:174). San Joaquin Valley: Lathrop, *K. Brandegee;* San Joaquin City, *Jepson* 10,285; near Mountain View School (15 mi. s. of Modesto), *Hoover* 94; near Deadmans Creek, n. of El Nido, Merced Co., *Jepson* 17,484; Lost Hills (5 mi. n.), Kern Co., *Hoover* 2667. Inner South Coast Range: Grant Lake, Palo Prieto Pass, *Jepson* 15,888. Western Mohave Desert: Bissell sta., *K. Brandegee.* Coastal S. Cal.: Bixby, near Los Angeles, *K. Brandegee;* San Bernardino, *Parish.* Colorado Desert: Cameron Lake, *T. Brandegee.*

Refs.—VERBENA BRACTEATA Lag. & Rodr., Anales Cienc. Nat. 4:260 (1801), based on a plant cult. in Bot. Gard. Madrid. *V. bracteosa* Michx., Fl. 2:13 (1803), type loc. "in regione Illinoensi"; Jepson, Man. 859 (1925).

8. **V. bipinnatifida** Nutt. var. **gooddingii** (Briq.) Jepson comb. n. Stems several from the base, ascending, 5 to 15 inches long; herbage spreading-hirsute; leaf-blades roundish in outline, ½ to 1¼ inches long, palmately 3-parted with the divisions pinnately cleft into oblong lobes; petioles ½ to as long; spikes short or capitate, dense, ½ to 1¼ inches long; bracts usually rather shorter than calyx; calyx-teeth obtuse, becoming tightly plicate about the prominent midrib so as to appear acute-subulate; corolla light blue, 3 to 5 lines broad, its lobes usually obcordate; stamens in pairs, 2 on short filaments at base of throat, 2 on longer fila-

ments at middle of throat, the anthers of these latter with a glandular appendage; nutlets subcylindric, the commissure reduced and narrow, not extending to apex, ornamented with a white band of retrorse hispidulose hairs.

Sandy slopes in the hills or rich flats in cañons, 2000 to 4000 feet: eastern Mohave Desert. East to southern Nevada and Arizona. May.

Tax. note.—The leaf-blades of Verbena bipinnatifida, in its most distinctive form, are usually bipinnately (or sometimes palmately) cleft into narrow divisions. In its most distinctive form the leaf-blades of var. gooddingii are palmately cleft but less deeply than in the species, although sometimes bipinnately cleft or divided. The two forms, therefore, cannot always be distinguished by leaf character. As to the corolla, this organ in var. gooddingii frequently exceeds the calyx as much as it exceeds the calyx in the species. Other offered differentials seem equally inconstant.

Locs.—Barstow, *Jepson* 6147; Gilroy Cañon, Providence Mts., *Jepson* 18,244; Cedar Cañon, Mid Hills, *Mary Beal;* Barnwell, New York Mts., *Jepson* 5491; Piute Creek, Piute Mts., *N. C. Wilson* 37. The usual form intergrades freely into a slight leaf form, scarcely worth a name, var. NEPETIFOLIA (Tidestrom) Jepson comb. n., leaf-blades orbicular-ovate, toothed or cleft.—Eastern Mohave Desert (Lanfair, *Tennent*). East to Colorado and south to Mexico (acc. L. M. Perry).

Refs.—VERBENA BIPINNATIFIDA Nutt., Jour. Acad. Phila. 2:123 (1821), type loc. Red River, Ark., *Nuttall.* Var. GOODDINGII Jepson. *V. gooddingii* Briq., Ann. Conserv. et Jard. Bot. Genève 10:103 (1907), type loc. Meadow Valley, Kernan, Nev., *Goodding* 645. *V. bipinnatifida* Jepson, Man. 859 (1925); not Nutt. Var. NEPETIFOLIA Jepson. *V. gooddingii* var. *nepetifolia* Tidestrom, Proc. Biol. Soc. Wash. 38:15 (1925), type loc. El Dorado Cañon, se. Nev., *Tidestrom* 8835.

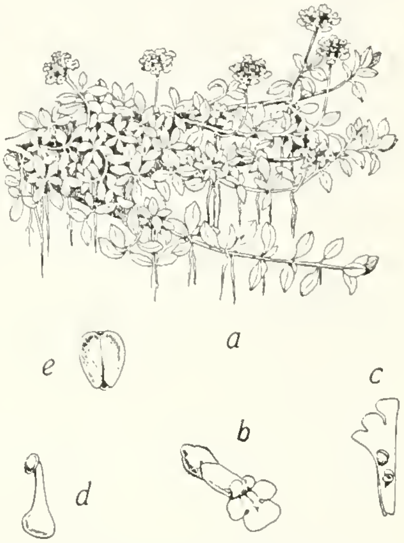

Fig. 421. LIPPIA NODIFLORA Michx. *a*, habit, × ½; *b*, fl., × 3; *c*, long. sect. of corolla, × 3; *d*, pistil, × 6; *e*, nutlet, × 3.

2. **LIPPIA** L. MAT GRASS

Prostrate perennial herbs or erect shrubs. Flowers on slender axillary peduncles, disposed in short spikes or heads and subtended by broad closely imbricated bracts. Calyx small and short, 2 or 4-cleft. Corolla-tube cylindric, the limb bilabiate, the upper lip retuse or emarginate, the lower lip 3-cleft. Stamens 2, inserted on lower side of throat. Ovary 2-celled, 1 ovule in each cell. Style mostly short; stigma thickish, oblique. Fruit with more or less corky pericarp, not readily separating into the 2 nutlets.—Species about 110, all continents. (Dr. A. Lippi, a French naturalist, killed in Abyssinia in 1703.)

Calyx 2-cleft, the lobes entire and lateral; pubescence with the hairs fixed by the middle, both ends acute; prostrate herbs.
  Leaves thickish, oblanceolate or obovate, mostly obtuse at apex or shortly subacute.................. 1. *L. nodiflora.*
  Leaves thinnish, ovate, mostly acute at apex..2. *L. lanceolata.*
Calyx about equally 4-cleft; pubescence with the hairs simple (fixed at one end); shrub; desert.... 3. *L. wrightii.*

1. **L. nodiflora** Michx. AMERICAN MAT-GRASS. (Fig. 421.) Stems extensively creeping, 1 to 4 feet long; herbage minutely canescent; leaf-blades cuneate-oblanceolate or -obovate, thickish, sharply serrate towards the apex, 5 to 10 lines long, sessile or shortly petioled; peduncles slender, 1 to 4 inches long, much exceeding the leaves; heads cylindraceous in age, 3 to 3½ lines thick; calyx-lobes low-triangular, bearing a hairy line or band at middle; corolla white or pink, 1 to 1½ lines broad, the middle lobe of lower lip transversely elliptic; fruit globose or didymous.

Low-lying "bottoms" and river banks, 5 to 900 feet: Great Valley; Sierra Nevada foothills; Mohave and Colorado deserts. South to Lower California and Central America, east to South Carolina, Texas and West Indies. July-Nov.

Locs.—Great Valley: Grimes (5 mi. s.), *Yates;* Main Prairie, Solano Co., *Jepson* 21,237; Old River, near Walnut Grove, Sacramento Co., *Jepson* 21,234; Brannan Isl., Sacramento Co., *Jepson* 10,221; Mossdale School, lower San Joaquin River, *Jepson* 21,233; San Joaquin City, San Joaquin Co., *Jepson* 10,281; Grayson, Stanislaus Co., *Jepson* 10,296; Tulare, Tulare Co., *Pendleton* 276. Sierra Nevada foothills: Auburn, Placer Co., *Ames;* Kentucky House, South Fork Calaveras River, *Jepson* 10,038. Mohave Desert: Piute Creek, near Piute Mts., *N. C. Wilson.* Colorado Desert: Rockwood, *Parish* 8336; Calexico, *Parish* 8332; Fort Yuma, *Parish* 8331.

Refs.—Lippia nodiflora Michx., Fl. 2:15 (1803), "ad littora Carolinae et ad ripas fluminis Ohio"; Jepson, Fl. W. Mid. Cal. 451 (1901), ed. 2, 352 (1911), Man. 859 (1925). *Zapania nodiflora* Lam., Encycl. Method. Bot. 8:839 (1808). *Phyla nodiflora* Greene, Pitt. 4:46 (1899).

2. **L. lanceolata** Michx. River Mat-grass. Stems trailing, 2 to 5 feet long; herbage hispidulose, greenish; leaf-blades ovate, ¾ to 2½ inches long, thinner than in no. 1, pinnately straight-veined, sharply serrate except at the broadly cuneate base which is abruptly narrowed to a short petiole; peduncles longer than the leaves; corolla bluish-white; fruit somewhat obovoid, the nutlets slightly corky-callus-margined at the commissure.

Moist soil of delta "bottoms" and river banks, 5 to 1200 feet: delta region of the Great Valley; coastal Southern California in and near the San Gabriel and San Bernardino valleys. East to New Jersey, Florida and Texas, south to Mexico. Aug.-Nov.

Locs.—Great Valley: Andrus Isl., Sacramento Co., *Jepson* 21,239; Grand Isl., Sacramento Co., *Jepson* 21,238; Lathrop, San Joaquin Co., *Bioletti.* Coastal S. Cal.: Ballona, Los Angeles Co., *Braunton* 447; San Bernardino, *Parish;* Anaheim Creek, Orange Co., *Booth* 1238a; Laguna Cañon, near Laguna Beach, *D. L. Crawford.*

Refs.—Lippia lanceolata Michx., Fl. 2:15 (1803), type loc. "in Carolina," *Ashley;* Jepson, Fl. W. Mid. Cal. 451 (1901), ed. 2, 352 (1911), Man. 860 (1925). *Phyla lanceolata* Greene, Pitt. 4:47 (1899).

3. **L. wrightii** Gray. Branching shrub, 3 to 4 feet high, its branchlets puberulent; leaf-blades ovate, crenulate, 2½ to 4 lines long, pubescence thin above, felt-like beneath; petioles short (½ line); branchlets slender, the spikes borne in the upper axils and thus paniculate; spikes dense, ½ to 1½ inches long, shortly peduncled; bracts ovate, shorter than the flowers; calyx 4-cleft, densely hirsute-tufted; corolla white, 1 line broad; nutlets with the calyx-lobes persistent dorsally, the commissure 1-planed, rather densely whitish-scrobiculate.

Limestone rocks, in cañons, 4000 to 5000 feet: eastern Mohave Desert. East to Texas. Aug.-Oct.

Locs.—Providence Mts., *T. Brandegee;* Pachalka Spr., Clark Mt., *Wolf* 7592.

Ref.—Lippia wrightii Gray; Torr., Bot. Mex. Bound. 126 (1859), type loc. "along the Cibolo of the Rio Grande," *Bigelow.*

LABIATAE. Mint Family

Herbs or low shrubs with square stems and always opposite simple leaves. Herbage possessing a volatile oil, hence aromatic. Flowers perfect, solitary in the axils or more commonly in small cymes; cymes sessile in the axils of the opposite leaves (rarely peduncled), commonly dense and having the appearance of a whorl, and here so called for convenience. Subtending leaves of the whorls frequently bract-like and the internodes short, the inflorescence thus becoming spike-like, or a single whorl sometimes terminal and head-like. Calyx always synsepalous, frequently 2-lipped, usually 5-toothed. Corolla tubular, 2-lipped, commonly with 2 lobes in the upper lip and 3 lobes in the lower lip; or the lips sometimes subequal and the lobes regular or nearly so. Stamens 4, inserted on tube of corolla, disposed in 2 pairs, or the upper pair of stamens wanting or represented by sterile filaments. Ovary superior, 4-celled, deeply 4-parted (or 4-lobed in Teucrium and Trichostema), separating when ripe into 4 small 1-seeded usually smooth nutlets. Style single, cleft at apex, commonly arising from the depression among the lobes of the ovary.—Certain species, as Lamium amplexicaule, are odorless. Sometimes the stems are not square. The corolla-tube is much reduced in Teucrium. In various species the nutlets may be solitary by abortion; they are roughened in Teucrium and Trichostema and sometimes in Scutellaria.—Genera 200, species about 3200, all continents, but mostly in warm and temperate regions.

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In a letter dated October 6, 1922, C. C. Epling, one of the author's former students, asked for a research subject in the systematic botany of flowering plants suitable for a higher degree thesis at Washington University, St. Louis. He was told to use the genus Monardella and did so, an acceptance which determined his main research interest in Labiatae for a lifetime as shown by the following partial bibliography.—C. C. Epling.: Notes on Linnaean types of Am. Labiatae (Jour. Bot. 67:1–12,—1929); Synopsis of genus Hyptis in N. Am. (Fedde, Repert. Sp. Nov. 34:73–130,—1933); Preliminary Revision of Am. Stachys (Fedde, Repert. Sp. Nov. Beih. 80:1–75,—1934); The Californian Salvias (Ann. Mo. Bot. Gard. 25:95–188,—1938); Notes on Stachys rigida Nutt. (Madroño 4:270–272,—1938); Notes on the Scutellariae of western N. Am. (Madroño 5:49–72,—1939).

I. Ovary 4-lobed, the style not basal; nutlets attached at the side by a prominent scar.

Corolla-limb very irregular, apparently 1-lipped; stamens moderately exserted..........1. TEUCRIUM.
Corolla-limb nearly equally 5-lobed, the lobes turned downward; stamens conspicuously long-exserted..........2. TRICHOSTEMA.

II. Ovary deeply 4-parted, the style basal; nutlets attached at the base, usually by a small scar.

A. CALYX 2-LIPPED, THE LIPS ENTIRE.

Calyx bearing a helmet-shaped protuberance on the back; flowers solitary in the axils of the opposite leaves; herbs..........3. SCUTELLARIA.
Calyx bladdery-inflated in fruit; flowers in loose spikes; shrub..........4. SALAZARIA.

B. CALYX REGULARLY 5-TOOTHED, OR 2-LIPPED WITH 3 TEETH IN THE UPPER LIP AND 2 TEETH IN THE LOWER LIP.

1. Corolla markedly bilabiate, the lips unequal.

Calyx with 10 spinescent teeth hooked at tip; stamens included in the corolla-tube; perennial herbs. 5. MARRUBIUM.
Calyx-teeth not hooked at tip; stamens not included in tube, exserted from corolla or included in throat.
  Upper pair of stamens longer than the lower; perennial herbs.
    Stamens exserted; anthers separated or distant..........6. AGASTACHE.
    Stamens not exserted; anthers approximate in pairs..........7. NEPETA.
  Upper pair of stamens shorter than the lower or equaling them.
    Calyx 2-lipped or with unequal teeth.
      Upper calyx-lip truncate, its margin with 3 cusps, the lower lip 2-cleft; flowers in a dense spike; herb..........8. BRUNELLA.
      Upper calyx-lip not truncate.
        Anthers 1-celled; anther bearing stamens 2; filaments bearing a linear connective, or jointed, or sometimes simple; shrubs or herbs..........9. SALVIA.
        Anthers 2-celled; herbs.
          Corolla-tube with a hairy ring within; anther-bearing stamens 4; flowers in loose axillary clusters; perennial herbs..........10. MELISSA.
          Corolla-tube without a hairy ring within.

Bracts orbicular or elliptic-ovate, with about 7 to 10 prominent spines on the margin; corolla white or white in part; anther-bearing stamens commonly 2; annuals..............11. ACANTHOMINTHA.

Bracts linear to narrow-ovate or oblanceolate, the margin ciliate or pubescent, not spinose; corolla blue or purple.

Calyx without a hairy ring in throat; anther-bearing stamens 4 or 2; bracts and calyx markedly ciliate (rarely subglabrous); cismontane annuals..................12. POGOGYNE.

Calyx with a dense hairy ring in throat; anther-bearing stamens 2; bracts merely puberulent; desert perennial.................. 13. HEDEOMA.

Calyx-teeth equal or nearly so (2-lipped in 1 species of no. 15); stamens 4 (2 in no. 18).

Calyx bladdery-inflated in fruit; flowers in a leafy raceme; corolla white or pinkish, its tube with a hairy ring within; shrubs..................................14. SPHACELE.

Calyx not bladdery-inflated in fruit.

Flowers few in loose whorls or solitary in the leaf axils; corolla-tube without a hairy ring within; shrubs or perennial herbs................15. SATUREIA.

Flowers several in dense whorls, usually forming an interrupted spike-like inflorescence.

Corolla-tube with a hairy ring within; calyx-teeth cuspidate or spine-tipped; ours (the native) perennial herbs..............................16. STACHYS.

Corolla-tube with no hairy ring within; calyx-teeth not spine-tipped.

Filaments glabrous; lower lip of corolla not saccate.

Calyx-teeth short and inconspicuous (⅙ as long as tube); corolla white; leaf-blades mostly ovate, sessile; perennial herbs. 17. PYCNANTHEMUM.

Calyx-teeth aristate or subulate, as long or nearly as long as the tube, hairy; lowest leaves petioled; ours annuals.

Corolla yellowish-white, its upper lip notched; anthers glabrous; leaf-blades lanceolate; deserts....................... 18. MONARDA.

Corolla purplish-red, its upper lip concave; anthers hairy; leaf-blades round-cordate.......................19. LAMIUM.

Filaments, at least the upper, hairy; lower lip of corolla with the middle lobe saccate or deeply bowl-shaped; shrubs................. 20. HYPTIS.

2. Corolla regular or nearly so, or the equal or subequal lobes bilabiately arranged.

Flowers in terminal heads; stamens 4; dry hills or valleys or rocky mountain slopes........................ 21. MONARDELLA.

Flowers in axillary whorls; marshes, river bottoms or wet flats.

Stamens 2..22. LYCOPUS.

Stamens 4..23. MENTHA.

1. TEUCRIUM L. GERMANDER

Ours herbs with the flowers in spike-like racemes. Calyx 5-parted. Corolla very irregular, seemingly 1-lipped; upper lip deeply cleft between its lobes, these partly united one on each side to the lateral lobes of the declined lower lip, so that the whole appears as if pinnately 5-cleft with the terminal lobe much the larger. Stamens 4, exserted and ascending from the cleft of the upper corolla-lip but not exceeding the lower lip, the lower pair longer than the upper. Anther-cells confluent, in this manner 1-celled. Nutlets with a large elliptic scar.—Species about 100, all continents. (Teucer, King of Troy.)

Leaves petioled; racemes dense, their bracts 3-divided; corolla little exceeding calyx..1. *T. cubense.*

Leaves sessile or subsessile; racemes very loose, their bracts entire or merely serrate; corolla 2 to 2½ times as long as calyx...2. *T. glandulosum.*

1. **T. cubense** Jacq. var. **densum** Jepson. ALKALI GERMANDER. Annual, stems many from the base, ascending, ¾ to 1 foot high, glabrous or nearly so; leaf-blades obovate-cuneate, crenately incised and sometimes 3-parted, ¾ to 1¼ inches long, petioled; racemes dense and regular, 2 to 9 inches long, the flowers about equaling the palmately 3-divided bracts, borne on pedicels ½ to 1 line long; calyx-lobes lan-

ceolate, twice as long as the tube; corolla pale blue or whitish, marked with a few purple dots, slightly hairy inside on palate, 3 to 4 lines long; nutlets reticulately ridged on back, the scar flattish.

Grassy spots under the shade of trees or bushes in desert basins or river bottoms, in sandy or dry alkaline soil, 100 to 500 feet: eastern Riverside Co. East to New Mexico. Nov.-Apr. It resembles Verbena bracteata in habit.

Locs.—Palo Verde Valley, *Jepson* 5258; Hayfields, Chuckwalla Mts., *Clary* 646.

Refs.—TEUCRIUM CUBENSE Jacq., Enum. Pl. Carib. 25 (1762). Var. DENSUM Jepson, Man. 861 (1925), type loc. Palo Verde Valley, *Jepson* 5258. *T. depressum* Small, Bull. N. Y. Bot. Gard. 1:288 (1899), type from N. Mex., *Wright* 1545.

TEUCRIUM OCCIDENTALE Gray, Syn. Fl. 2:349 (1878), type loc. "Nebraska (*Hayden*, etc.)." Erect, 1 to 2 feet high; herbage loosely pubescent; leaves ovate-oblong, entire, sharply serrate; calyx villous-viscid, merely 5-toothed.—New Mexico to British Columbia and Ontario. "Sacramento River, *Pickering*," in 1841 (Bot. Cal. 2:477), but not since found in California, although regularly reported as Californian in subsequent floras of neighboring states.

2. **T. glandulosum** Kell. Perennial, the stems few or several from a woody root-crown, erect with long simple branches, 1 to 2 feet high; herbage glabrous, non-glandular; leaves sessile or subsessile, the blades ¾ to 1¼ inches long, linear or lanceolate, entire or remotely serrulate, or those above the base palmately 2 or 3-parted into lanceolate or linear lobes; racemes loose, the flowers remote, borne in the axils of lanceolate bracts, their pedicels 5 to 7 lines long; stamens conspicuously exserted, ascending and curved; corolla whitish or "blue," 6 to 9 lines long, the lip partly puberulent above and pilose on back; nutlets with rows of shallow pits on the back, hairy at apex, the scar with a central nipple-like protuberance.

Among rocks in shady moist places of cañons, 1400 to 1500 feet: southeastern San Bernardino Co. South to Lower California. Apr.-May.

Note on range.—The range of Teucrium glandulosum is not yet well established. From Cedros Island, the type locality, several collections are known and a few have long been known from the mainland of Lower California: San Pablo, *Purpus* 57; San Jorge, San Julio Cañon (Proc. Cal. Acad. ser. 2, 2:198). In California it was not, however, until 1935 that a single station was discovered in the Whipple Mountains along the Colorado River by F. W. Peirson. In collections from Lower California the stems and leaves are commonly glabrous and non-glandular (as in California plants), but the stems may rarely bear very thin and localized areas of glandular-pilose hairs.

Ref.—TEUCRIUM GLANDULOSUM Kell., Proc. Cal. Acad. 2:23 (1859), type loc. Cedros Isl., L. Cal., *Veatch*.

2. **TRICHOSTEMA** L. BLUE CURLS.

Ours ill-scented annual herbs or small shrubs with entire leaves and blue (occasionally pinkish or whitish) flowers in axillary cymes or the cymes often becoming raceme-like in age. Calyx equally or almost equally 5-cleft. Corolla with oblique limb, the upper and lateral lobes alike (oblong or ovate), the middle lobe of lower lip similar or markedly different; tube in ours slender, often far exceeding the calyx and abruptly geniculate or curved into an arc of a circle just below the limb. Stamens 4, with the anther-cells divaricate; filaments capillary, blue or violet, spirally coiled in the bud, in anthesis very much exserted, ascending between the deeply parted upper lobes of the corolla and curved outward and downward. Nutlets pyriform, obliquely attached to the receptacle, rugose-reticulate on back, and often papillate on the summit.—Species 11, North America. (Greek trichos, hair, and stemon, stamen.)

A. Annuals; cymes borne in the axils of the leafy stems.

Corolla 1 to 3 lines long, tube included in the calyx; nutlets rugose-reticulate (the ridges always evident), less than 1 line long (to 1¼ lines in *T. simulatum*).
    Herbage cinereous-pubescent; leaves linear to lanceolate, not costate-veined; corolla 1 line long..1. *T. micranthum.*

Herbage soft-villous or glandular-villous; leaves oblong to oval or ovate-lanceolate, costate-veined; corolla 2 to 3 lines long.
  Soft-villous, seldom glandular; leaves oblong to oval; calyx-lobes narrow; corolla 3 lines long..2. *T. oblongum.*
  Glandular-villous; leaves lanceolate; calyx-lobes broad; corolla 2 lines long........................3. *T. simulatum.*
Corolla commonly 3 to 6 lines long, the tube exserted from the calyx; nutlets rugose-papillate (or the ridges obscured by tomentum), at least 1 line long (except in var. of *T. laxum*).
 Leaves petioled; stems diffusely branched, rather sparsely leafy; cymes somewhat loose.........4. *T. laxum.*
 Leaves sessile or nearly so; stems mostly erectly branching from below, densely leafy; cymes dense.
  Corolla 5 to 6 lines long; leaves ovate-lanceolate or narrower; nutlets merely setulose, the ridges evident..5. *T. lanceolatum.*
  Corolla 3 to 4 lines long; leaves broadly ovate; nutlets densely pubescent, the ridges obscure..6. *T. ovatum.*

B. Low shrubs; cymes aggregated in a spike-like thyrse, the thyrse sparingly leafy with reduced leaves or quite leafless above.

Corolla 9 to 11 lines long, the tube plainly exserted; cymes dense, subsessile................7. *T. lanatum.*
Corolla 4 to 6 lines long, the tube barely exserted; cymes open, on peduncles 3 to 4 lines long.........8. *T. parishii.*

1. **T. micranthum** Gray. Stem simple or branched from the base, 3 to 9 inches high, leafy to the summit; herbage ashy-pubescent, somewhat glandular; leaf-blades lanceolate to linear, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long, narrowed at base into short petioles; cymes borne in all but the lower axils, 3 to 7-flowered, pedunculate, shorter than the leaves; calyx campanulate, the lanceolate lobes little longer than the tube; corolla 1 line long, little exceeding the calyx; stamens moderately exserted; nutlets $\frac{3}{4}$ line long, reticulately and finely ridged, the ridges at summit hispidulose with spreading hairs.

Open pine forests, 6800 to 8200 feet, very local: San Bernardino and San Jacinto mountains. Also in northern Lower California. July-Aug.

Geog. note.—This species is representative of the narrow endemics in the mountains of Southern California. It is in addition highly localized in its occurrence and of California collections only five stations are here presently available, three in the San Bernardino Mts. (Holcomb Valley, acc. *Peirson;* Bear Valley, *Parish* 1473; Little Bear Valley) and two in the San Jacinto Mts. (Strawberry Valley; Hidden Lake, *C. F. Meyer* 565). It is, however, "frequently found throughout the pine belt on Mt. San Jacinto" (Univ. Cal. Publ. Bot. 1:114).

Refs.—TRICHOSTEMA MICRANTHUM Gray, Syn. Fl. 2:348 (1878), type loc. Bear Valley, San Bernardino Mts., *Parry & Lemmon;* Jepson, Man. 862 (1925).

2. **T. oblongum** Benth. MOUNTAIN BLUE CURLS. Stems erect, simple or branched below, 6 to 13 inches high; herbage villous or the leaves pubescent, the stems sometimes glandular; leaf-blades oval or oblong (sometimes oblong-lanceolate), with narrowed base, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, the petioles mostly short, $\frac{1}{4}$ to 1 (or 3) lines long; cymes glomerate, many-flowered, borne in all the leaf-axils except the lowest, short-pedunculate; calyx villous, its lobes narrow, attenuate, longer than the tube, nearly equaling the corolla, accrescent; corolla 3 lines long, lavender-purple, the middle lobe of lower lip white with a purple spot at base, the cleft between lobes of upper lip deeper than sinuses between the two lips; middle lobe of lower lip concave or bowl-shaped; filaments 4 to 5 lines long; nutlets reticulately ridged, the ridges finely hispidulose.

Moist places in mountain valleys and flats, 200 or mostly 2000 to 7400 feet: Cuyamaca and San Bernardino mountains; Sierra Nevada from Tulare Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges from Lake Co. to Humboldt Co. North to Washington. June-Aug.

Note on the corolla.—In shape and position of its lobes, the corolla of Trichostema oblongum is distinctive. The lobes of the upper lip and the lateral lobes of the lower lip are equal, of the same size, shape and color. These lobes, one from each lip, are turned right and left in parallel pairs and are approximate by their tips. The middle lobe of lower lip is subtruncatish at apex.

Locs.—S. Cal. mts.: Cuyamaca; Arrowhead Lake, San Bernardino Mts., *Braunton* 1041; Bluff Lake, San Bernardino Mts., *J. Grinnell.* Sierra Nevada: Little Kern River near Trout Mdws., *Jepson* 4919; Rogers Valley, n. of Auberry, Fresno Co., *Jepson* 12,898; Arnold Mdw., Madera Co., *A. L. Grant* 1354; Cedar Brook, Mariposa Co., *Jepson* 15,968; Big Mdw., betw. Hazel Green and Yosemite, *Jepson* 14,885; betw. Mather and Crocker sta., Tuolumne Co., *Jepson* 4634; Hetch-Hetchy, *Jepson* 3443; Duffield Cañon, Soulsbyville, Tuolumne Co., *Jepson* 7680; Poor Lake, w. Mono Co., *Ottley* 1127; Fallen Leaf, Eldorado Co., *Newlon;* Bear Valley, Nevada Co., *Jepson* 14,886; Butte Mdws., Butte Co., *Heller* 11,620; Meadow Valley, Plumas Co., *Jepson* 10,642; Egg Lake, Modoc Co., *M. S. Baker;* Mt. Shasta, *Palmer* 2492. North Coast Ranges: Lower Lake (3 mi. w.), *Hoover* 3814; Eel River, n. of Potter Valley, Mendocino Co., *Purpus* 1250; Buck Mt., Humboldt Co., *Tracy* 2824; Trinity River Valley at Willow Creek, *Tracy* 8327.

Refs.—TRICHOSTEMA OBLONGUM Benth., Lab. Gen. et Sp. 659 (1835), type loc. Ft. Vancouver, Columbia River, *Douglas;* Jepson, Fl. W. Mid. Cal. 454 (1901), ed. 2, 354 (1911), Man. 862 (1925).

3. **T. simulatum** Jepson. Stem erect, branched or simple, 7 to 11 inches high, the leaves rather remote; herbage glandular-villous; leaf-blades narrowly to broadly lanceolate, 1 to 2 inches long, on petioles 2 to 7 lines long; cymes on peduncles 2 to 6 lines long; calyx-lobes broad, triangular-acute, about equaling the tube; corolla purplish, 2 lines long; nutlets strongly rugose, puberulent throughout, 1¼ lines long.

Montane slopes, 2300 to 4400 feet: Sierra Nevada from Plumas Co. to Modoc Co.; west to Siskiyou Co. July-Aug.

Locs.—Little Grizzly Creek (near mouth), below Genessee, Plumas Co., *Heller & Kennedy* 8839; Susanville (4 mi. w.), *Hoover* 4603; Forestdale, sw. Modoc Co., *M. S. Baker;* e. Siskiyou Mts., *Canby.*

Ref.—TRICHOSTEMA SIMULATUM Jepson, Man. 862 (1925), type loc. Klamathon, Siskiyou Co., *Copeland* 3534.

4. **T. laxum** Gray. VINEGAR WEED. Stem simple or openly branched, 8 to 16 inches high, sparsely leafy; herbage dark green, minutely pubescent; leaf-blades lanceolate or oblong-lanceolate, acuminate, pinnately veined, 1 to 2 inches long, on slender petioles; cymes peduncled, rather loose, the flowers in 2 rows on the branches; corolla purple or deep blue, thinly hirsute, 4 to 6 lines long, the middle lobe of lower lip with upturned sides or undulate margins; nutlets ridged or tuberculate on back, 1 line long, minutely hispidulous.

Gravelly sands of stream bottoms or in low fields, 200 to 2500 feet, North Coast Ranges from Humboldt Co. to Sonoma Co. Also in southern Oregon. June-Sept.

Locs.—S. Ore.: Umpqua Valley, acc. *M. E. Peck.* North Coast Ranges: South Fork (near mouth) of Trinity River, *Tracy* 7815; Hydesville, Humboldt Co., *Tracy* 958; DeVoy Flat, South Fork Eel River (s. of Garberville), *Jepson* 9465; Navarro River, Mendocino Co., *Peirson* 10,248; Mud Flat, Newville-Covelo road, w. Glenn Co., *Heller* 11,526; Gravelly Valley, Eel River, n. Lake Co., *Jepson* 14,877; Van Ness ranch, near Mt. St. Helena, *Alice King;* Limekiln Creek, Pope Valley, Napa Co., *Jepson* 19,024; Devils Gate, Putah Creek, sw. Yolo Co., *Jepson* 14,878.

Var. **rubrisepalum** (Elmer) Jepson. Leaves subsessile or the lower petioled; pubescence long-pilose; cymes more densely flowered; calyx-lobes becoming red; corolla 3 to 3½ lines long; nutlets ¾ line long.—Stream-beds and hillside hollows: San Benito Co.; Tuolumne Co. and Mariposa Co. foothills (Chinese Camp, *Hoover* 2716; Coulterville, *Hoover* 3824). Except in size of corolla and nutlets, it closely matches some specimens of typical T. laxum.

Refs.—TRICHOSTEMA LAXUM Gray, Proc. Am. Acad. 7:387 (1868), type loc. "Little Geysers, Napa Co." (really Geyser Cañon, ne. Sonoma Co.), *Brewer;* Jepson, Fl. W. Mid. Cal. 453 (1901), ed. 2, 354 (1911), Man. 862 (1925). Var. RUBRISEPALUM Jepson, Man. 862 (1925). *T. rubrisepalum* Elmer, Bot. Gaz. 41:310 (1906), type loc. Hernandez, San Benito Co., *Lathrop.*

5. **T. lanceolatum** Benth. TURPENTINE WEED. CAMPHOR WEED. (Fig. 422.) Stem simple or branching from near the base, very leafy, 6 to 16 inches high; herbage pale green, cinereous or villous-pubescent, minutely but abundantly glandular; leaf-blades lanceolate, acuminate, with 3 to 5 strong almost parallel nerves or ribs, closely ranked on stem, often plicate and falcate, ¾ to 1¼ inches long, sessile, or the lowest subsessile; cymes short-peduncled or nearly sessile, often secundly disposed; calyx villous; corolla light blue, 5 to 6 lines long, somewhat pubescent, its tube towards apex abruptly and strongly recurved like a hook; upper lip of corolla longer than the lower; nutlets papillate on back, white-setulose, 1 to 1½ lines long.

Dry plains and open hills, 10 to 3500 feet: common throughout cismontane California except in the immediate vicinity of the coast northward; also in the western Mohave Desert. North to Washington. Aug.-Oct.

Field note.—Trichostema lanceolatum is a characteristic dry season plant of late summer and autumn on arid treeless clay plains, valley floors and open slopes of the foothills at a time when they are summer-whitened by the dead annual vegetation of the previous rainy season. In such habitats it may form extensive colonies for a hundred yards or for miles or even for leagues and is often the only living plant of its season where it flourishes most abundantly, though it is again, frequently, an associate of Eremocarpus setigerus. It is, however, absent in the main or wholly from the alluvial flood-plain floors of the Great Valley where the rich loams contain a high organic content. The plant may consist of a single unbranched axis; more frequently the main axis is superseded by the many branches arising near the ground. On such branches the flowers turn outward and the leaves bend inwards and stand in two indistinctly defined rows behind the axis of the branch. The leaves are often twisted or incurved at tip; frequently the sides are involute in such a way as to make the blade nearly tubular. The upper lobes of the corolla are tubular-involute or twisted, spreading after the manner of two horns, the long backward sweeping curve of the stamens retreating from their notch. The lateral lobes of the lower lip are similar to the lobes of the upper lip but are not so strongly involute nor so strongly spreading. The middle lobe of the lower lip curves outward and downward, its sides turned upwards so as to resemble a shallow trough. The odor of the flowers is extremely heavy. This species is a bee plant and considered of importance in the honey industry.

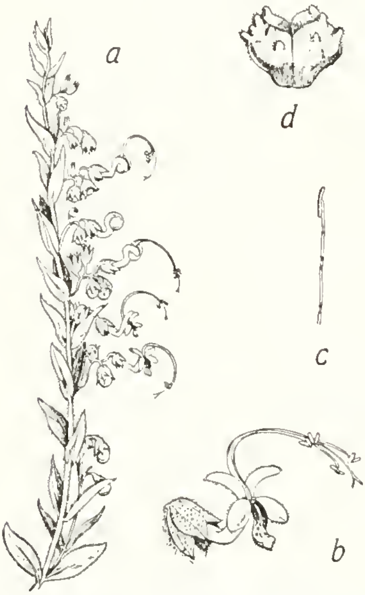

Fig. 422. TRICHOSTEMA LANCEOLATUM Benth. *a*, fl. branchlet, × ½; *b*, fl. × 1½; *c*, upper part of stamen, × 2½; *d*, fr., × 2½.

Locs.—Coastal S. Cal.: San Diego; Riverside; Claremont, San Bernardino Valley, *C. F. Baker* 3728; Los Angeles, *E. D. Palmer;* Calabasas, sw. San Fernando Valley, *Jepson* 20,186; Ojai Valley, *Thacher* 41; Santa Barbara, *L. E. Hunt.* W. Mohave Desert: Palmdale, *Voght* (herbage notably strigose). Coast Ranges: Posts, Santa Lucia Mts., *Jepson* 2585; Milpitas, *R. J. Smith;* Alvarado, Alameda Co., *Jepson* 14,879; Healdsburg, *Jepson* 9430; Petrified Forest, Sonoma Co., *Jepson* 14,883; Rumsey, w. Yolo Co., *Jepson* 16,744; Gravelly Valley, Eel River, n. Lake Co., *Jepson* 14,884; Devoy Flat, South Fork Eel River, *Jepson* 9466; Phillipsville, cent. Humboldt Co., *Jepson* 17,874; head of Canoe Creek, Humboldt Co., *Tracy* 4759; Yreka, *Butler* 1793. Great Valley: betw. Tulare and Tulare Lake, *Palmer* 2695; Kettleman Plain, w. Kings Co., *Jepson* 20,224; Fresno, *I. T. Walker;* El Nido, 12 mi. s. of Merced, *Hoover* 1598; Vacaville, *Jepson* 14,882; Winters, *Jepson* 14,881; Chico, *H. A. Dutton;* Red Bluff, Tehama Co., *Jepson* 15,278. Sierra Nevada foothills: betw. Weldon and Isabella, Kern Co., *Voegelin;* Three Rivers, Tulare Co., *Jepson;* Knights Ferry, *Sanford* 174; near Marble Creek, Eldorado Co., *H. M. Wheeler;* Big Chico Creek, Butte Co., *Heller* 11,137; Montgomery Creek, Shasta Co., *M. S. Baker.*

Refs.—TRICHOSTEMA LANCEOLATUM Benth., Lab. Gen. et Sp. 659 (1835), type loc. Fort Vancouver, Columbia River, *Douglas;* Jepson, Fl. W. Mid. Cal. 453 (1901), ed. 2, 354 (1911), Man. 862 (1925).

6. **T. ovatum** Curran. ALKALI BLUE CURLS. Stem stout, simple or branched from base, rather crowded with leaves, 6 to 18 inches high; herbage densely villous; leaf-blades ovate, apiculate with a callous cusp, 6 to 10 lines long, subsessile; calyx-lobes lanceolate, attenuate, villous; corolla 3½ lines long, the tube somewhat exserted; stamens long-exserted; nutlets rugose, the upper half or even the whole surface rather densely hairy-pubescent, 1 line long.

Alkaline plains, 200 to 1000 feet: upper San Joaquin Valley plain and its bordering foothills, from Fresno Co. to Kern Co. June-Aug.

Geog. note.—The geographic distribution of Trichostema ovatum, a species formerly thought to be rare, has recently become better known. An inhabitant of alkali flats, it occurs widely over the full area of the upper San Joaquin Valley in suitable stations. Within the limits of its range it is quite as abundant as Trichostema lanceolatum, with which it is sometimes associated. In validation of the frequency of occurrence the following localities are cited: Mendota, Fresno Co., *Hoover* 2616; Kerman, Fresno Co., *Hoover* 2589; Raisin City, Fresno Co., *Hoover* 2319; Kettleman Hills near Avenal, Kings Co., *Hoover* 2641; Earlimart, Tulare Co., *Hoover* 2677; Lost Hills (5 mi. n.), Kern Co., *Hoover* 2670; Famosa, Kern Co., *Hoover* 2674; Bakersfield, *Davy* 2400; Sunset (Pioneer), near Maricopa, *Watts.*

Refs.—TRICHOSTEMA OVATUM Curran, Bull. Cal. Acad. 1:154 (1885), type loc. Bakersfield, *Curran* (that is, along railroad s. of Sumner, near Bakersfield, acc. to label of type coll.); Jepson, Man. 863 (1925).

7. **T. lanatum** Benth. CALIFORNIA ROMERO. Leafy shrub 2 to 5 feet high, branched from the base; leaf-blades linear-lanceolate, glabrous and green above, more or less lanate below, revolute, 1 to 2 (or 2½) inches long, sessile; flowers borne in a virgate interrupted sometimes leafy spike-like thyrse; thyrse 6 to 14 inches long, composed of whorls of cymes; cymes dense, subsessile, covered with a copious purple wool; calyx-lobes 2 to 3 lines long, reticulate-venose; corolla blue, 9 to 11 lines long, arachnoid-tomentose outside, the tube about half again as long as the calyx; stamens much exserted (8 to 14 lines beyond the corolla-tube); nutlets rugose-reticulate, minutely hispidulose, with longer curly hairs at apex, 1½ lines long.

Dry rocky benches, cañon bottoms or open ridges of the coastal mountains, often associated with Adenostoma fasciculatum, 500 to 3500 feet: San Benito and Monterey Cos. to Los Angeles and Orange Cos. Apr.-July.

Locs.—Lorenzo Creek, San Benito Co., *Bettys;* Santa Lucia Peak, *Jepson* 4734; Sisquoc River, Santa Barbara Co., *M. S. Baker* 29; Ojai Valley, *Olive Thacher* 42; Saugus, n. Los Angeles Co.; Santiago Cañon, Santa Ana Mts., *Helen D. Geis.*

Refs.—TRICHOSTEMA LANATUM Benth., Lab. Gen. et Sp. 659 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 454 (1901), ed. 2, 354 (1911), Man. 863 (1925).

8. **T. parishii** Vasey. Shrub (similar to no. 7), 1 to 2 (or 3) feet high; leaf-blades linear or narrowly lanceolate, glabrous above, tomentulose (or even glabrous) below, revolute, 1 to 1½ inches long; flowers borne in a spike-like thyrse; thyrse 4 to 11 inches long, composed of 4 to 10 whorls of cymes, the cymes secund, somewhat scorpioid, pedunculate, open and somewhat spreading in fruit; calyx-lobes 1 line long, the venation obscure; corolla 4 to 6 lines long, the tube barely exserted, the 2 lateral lobes of lower lip and the 2 lobes of upper lip ovatish, alike in form and color (light purple), the middle lobe of lower lip different from the other 4 lobes of the corolla, obovate, concave, notched at apex, dark purple with 2 purple spots on the white base; nutlets similar to those of T. lanatum but slightly smaller (about 1¼ lines long).

Dry slopes of interior mountains and desert drainages, 1500 to 5800 feet: San Gabriel, San Bernardino and San Jacinto mountains south to eastern San Diego Co. South to northern Lower California. June-July.

Locs.—Arrastre Creek, San Gabriel Mts., *Peirson;* Mt. Gleason, San Gabriel Mts., *Barber* 241; Cajon Pass, *Peirson;* San Bernardino, *Parish* 3645; Foxesee Creek, San Bernardino Mts., *Munz* 6315; Mt. San Jacinto (w. base), *C. V. Meyer* 214; Hemet Valley, near Kenworthy, *Clary* 1583; Palm Cañon of San Jacinto (upper end), *Jepson* 1335; Julian, *T. Brandegee;* betw. Jacumba and Pine Valley, San Diego Co., *C. V. Meyer* 436.

Refs.—TRICHOSTEMA PARISHII Vasey, Bot. Gaz. 6:173 (1881), type loc. San Diego Co., *Parish & Vasey. T. lanatum* var. *denudatum* Gray, Syn. Fl. 2:459 (1886), type loc. San Bernardino Co., *Parish;* Munz, Bull. S. Cal. Acad. 23^4:130 (1924); Jepson, Man. 863 (1925).

3. **SCUTELLARIA** L. SKULL-CAP

Ours perennial herbs, the flowers solitary in the opposite axils (axillary pairs) or, when the leaves are reduced, forming spikes or racemes. Calyx 2-lipped, both lips entire, the upper with a scale-like or crest-like projection on the back, in anthesis campanulate, after anthesis closed, and in fruit splitting to the base. Corolla with a long-exserted tube; upper lip galeate, entire or barely notched, the lateral lobes of the lower lip more or less attached to it so that it appears 3-lobed, the middle lobe seeming to constitute the whole lower lip. Stamens 4; anthers ciliate-pilose. Upper fork of style short or none. Nutlets papillate or smooth, rarely wing-margined.—Species about 200, all continents. (Latin scutella, a dish, on account of the conspicuous protuberance on the fruiting calyx.)

Leaf-blades all broad and subcordate or truncate at base, sessile or nearly so.
  Leaf-blades acute, the lower serrate; corolla blue..1. *S. galericulata.*
  Leaf-blades obtuse, the lower crenulate; corolla whitish or cream-color..............2. *S. bolanderi.*

Leaf-blades, at least the upper, obtuse or narrowed at base, always petioled.

Tubers none or only slightly developed; stems of medium height (5 to 15 inches) and erect; leaf-blades linear to oblong or oblong-ovate or oval.

Stems with the leaves smaller above (those subtending the flowers conspicuously reduced); leaf-blades oval-ovate to oblong-lanceolate; corolla white or cream-color, the lips subequal, the throat subsaccate............3. *S. californica.*

Stems equably leafy to the top, the leaves subtending the flowers not at all or only inconspicuously reduced; leaf-blades (at least above the base) commonly linear or oblong, varying to ovate; corolla blue to purple, not saccate.

Corolla 9 to 14 lines long, its lips unequal and markedly gaping, the erect galea with its incurved apex standing over and well above the floor of the spreading middle lobe of lower lip; middle lobe of lower lip recurved-spreading with upturned edge; corolla-tube narrow, curving, expanded only above............4. *S. angustifolia.*

Corolla 6 to 7 lines long, its lips subequal, the middle lobe of lower lip as well as the galea erect; middle lobe of lower lip with plane edge; corolla-tube straight or only slightly curved, dilated above............5. *S. antirrhinoides.*

Tubers conspicuous, terminating the slender root-stocks; stems low (2 to 5 inches high); leaf-blades ovate to obovate or oblong.

Leaf-blades ovate, toothed or rarely entire, thinly hirsute; corolla blue; cismontane Cal. 6. *S. tuberosa.*

Leaf-blades obovate to oblong, entire, densely puberulent; corolla white; ne. Cal............7. *S. nana.*

1. **S. galericulata** L. Stems slender, simple or branched, ¾ to 2 feet high; herbage puberulent; leaf-blades ovate-lanceolate or oblong-lanceolate, serrate or the upper entire, subcordate at base, 1 to 1¾ inches long, subsessile or on petioles ½ line long, the uppermost much reduced; flowers axillary, 6 to 8 lines long, on pedicels shorter than the calyx; calyx and corolla puberulent; corolla blue, throat naked within, the lower lip nearly erect and slightly surpassing the upper; nutlets densely papillate.

Stream bottoms and lake shores: delta region of the Great Valley, 5 to 25 feet; northern Sierra Nevada, 4000 to 6500 feet, from Eldorado Co. to Shasta Co. East to Arizona, north to British Columbia, thence far east to Newfoundland. July-Aug.

Locs.—San Joaquin Co.: Bouldin Isl. (Zoe 4:215); Middle River, *Congdon.* Sierra Nevada: Cascade, Lake Tahoe, *Chesnut & Drew;* Truckee River, *Sonne;* North Fork Feather River, Plumas Co., *R. M. Austin;* Fall River Lake, Shasta Co., *M. S. Baker.*

Refs.—SCUTELLARIA GALERICULATA L., Sp. Pl. 599 (1753), type European; Jepson, Fl. W. Mid. Cal. ed. 2, 355 (1911); Epling, Madroño 5:57 (1939). *S. epilobiifolia* Ham., Ann. Soc. Linn. Lyon 1:32 (1832), acc. Epling l.c.; Jepson, Man. 863 (1925). Cf. also Fer., Rhod. 28:35 (1921).

2. **S. bolanderi** Gray. SIERRA SKULLCAP. Stems simple or branching chiefly from base, 6 to 17 inches high, leafy to the top, the leaves equaling or longer than the internodes; herbage puberulent; leaf-blades oblong-ovate or ovate-elliptic, obtuse, sparsely crenulate or entire, closely sessile by a subcordate or rarely obtuse base, ½ to 1¼ inches long; flowers on short (½ to 1 line long) pedicels, not equaling the leaves or only slightly exceeding them; corolla white, 7 to 9 lines long, the throat ventricose-dilated, villous within, the lips about equal with the lower one dotted or minutely splotched with purple; nutlets densely papillate.

Moist soil in meadows and along creeks in the foothills and mountains: Sierra Nevada, 1000 to 4000 feet, from Plumas Co. to Tulare Co. June-July.

Locs.—Indian Valley, Plumas Co. (Bot. Cal. 1:603); South Jackson, Amador Co., *Hansen* 448; Angels Camp, Calaveras Co., *Davy* 1486; Standard City, Tuolumne Co., *Hoover* 2552; Mariposa, *Congdon;* Rogers Valley, 4 mi. n. of Auberry, Fresno Co., *Jepson* 12,885; Three Rivers, *Culbertson* 4199.

Var. **austromontana** (Epling) Jepson comb. n. Corolla (tube plus galea) slightly smaller (6 to 7 lines long), the lower lip not spotted.—Southern California, on or near the main montane axis from the San Bernardino Mts. to the Cuyamaca Mts.: Victorville, *Parish* 10,599; El Monte, San Gabriel Valley, 300 feet (Abrams, Fl. Los Ang. ed. 2, 313), perhaps a waif from the mountains; San Jacinto Mts. (Dav. & Mox., Fl. S. Cal. 315); Palomar Mt., *McClatchie;* Cuyamaca Mts., *T. Brandegee.* The altitudes are mainly 2000 to 6000 feet.

Refs.—SCUTELLARIA BOLANDERI Gray, Proc. Am. Acad. 7:387 (1868), type loc. Clarks Mdws. (Wawona), Mariposa Co., *Bolander;* Jepson, Fl. W. Mid. Cal. 454 (1901), ed. 2, 355 (1911), Man. 864 (1925). Var. AUSTROMONTANA Jepson. *S. bolanderi* subsp. *austromontana* Epling, Madroño, 5:58 (1939), type loc. Lake Henshaw, San Diego Co., *Gander* 2739.

3. **S. californica** Gray. CALIFORNIA SKULLCAP. Stems clustered, commonly simple, 5 to 8 (or 15) inches high; herbage puberulent; leaf-blades oval-ovate to oblong-lanceolate, 8 to 16 lines long, the lower disposed to be crenate and purplish beneath, the upper narrower and entire, the uppermost much reduced and shorter than the flowers; petioles 1 to 3 lines long; corolla nearly white or slightly yellowish, minutely short-hairy with spreading hairs, 8 to 12 lines long, the throat ampliate-inflated and pilose within, the lips both erect and equal or nearly so; nutlets rugulose or papillate.

Borders of brush or in open woods on hillsides or in cañons, (150 or) 2500 to 6000 feet: Coast Ranges from Alameda and Marin Cos. to Trinity Co.; Sierra Nevada from Calaveras Co. to Shasta Co. June-July.

Tax. note.—Scutellaria californica has been in recent years reduced to a variety of Scutellaria bolanderi but the two do not seem closely related as understood here. Asa Gray made it a species although he originally published it as a variety of Scutellaria antirrhinoides. In the Botany of California he attributes his Scutellaria antirrhinoides var. californica first of all to the coastal region, "Alameda [Co.] to Mendocino Co." In this region grows a plant which has been traditionally regarded as Scutellaria californica Gray by California botanists. It inhabits low dry foothills, while Scutellaria bolanderi, on the other hand, is found in Sierra Nevada meadows or on borders of surface streamlets. The upper leaves, especially those subtending the flowers, are conspicuously reduced in Scutellaria californica, while in Scutellaria bolanderi the stem is equably leafy to the top. In Scutellaria californica the leaves are spreading or divergent, shortly petioled and shorter than the internodes. In Scutellaria bolanderi the erect sessile leaves cordately or subcordately clasp the stem and are longer than the internodes.

Locs.—Coast Ranges: Berkeley Hills, *Jepson* 9792; Mt. Tamalpais, *Eastwood* 1530; Sonoma Cañon, Kenwood, Sonoma Co., *Jepson* 10,002; upper Suisun Valley, *Jepson* 14,932; Santa Rosa, *M. S. Baker* 591; Bartlett Sprs., n. Lake Co., *Jepson* 18,943; Potter Valley, Mendocino Co., *Purpus;* betw. Mud Flat and Bennett Spr., w. Glenn Co., *Heller* 11,551a; South Fork sta., lower Eel River, *Constance* 936; Buck Mt., Humboldt Co., *Tracy* 15,453; Three Forks of Mad River, Trinity Co., *Tracy* 10,201. Sierra Nevada: Dorrington, Calaveras Co., *Ivan Branson;* Sly Park, Eldorado Co., *Hall* 11,382; French Mdw., Middle Fork American River, *L. S. Smith* 1670; Donner Lake, *Heller* 7020; Bear Valley, Nevada Co., *Jepson* 14,934; Smartsville, Yuba Co., *Cramsie;* Quincy, *Clemens;* Payne Creek sta. (4 mi. w.), Tehama Co., *Eastwood & Howell* 1877; Burney Spr., Shasta Co., *Peirson* 10,283.

Refs.—SCUTELLARIA CALIFORNICA Gray, Syn. Fl. 2:381 (1878); Jepson, Fl. W. Mid. Cal. 454 (1901), ed. 2, 355 (1911), Man. 864 (1925). *S. antirrhinoides* var. *californica* Gray, Proc. Am. Acad. 8:396 (1872), type collected by *Fremont*, presumably (without reasonable doubt) in Cal.; the label of the type (Gray Herb.) bears the printed heading, "Fremont's Expedition to California, 1845–7," with the date 1846 written in. *S. bolanderi* var. *californica* Penland, Rhod. 26:68 (1924).

4. **S. angustifolia** Pursh. Stems erect, simple or somewhat branched, 4 to 13 (or 21) inches high; herbage subglabrous to finely puberulent; leaf-blades oblong to linear, varying to ovate, entire or very sparsely toothed, ¾ to 1½ (or 1¾) inches long, subsessile or the lower distinctly petioled (the petioles 1 to 3 lines long); basal leaves orbicular to ovate or cordate, 5 to 7 lines long, the petioles usually longer; flowers 9 to 14 lines long, the pedicels equaling the calyx; corolla blue, the tube distinctly curving above calyx, the lips at maturity markedly unequal, the lower one villous inside, its middle lobe with upturned edge; nutlets thinly papillate.

Moist soil of stream bottoms, springy spots on hillsides, dry slopes, rocky ledges or pine flats: mountains of Southern California, 5000 to 7000 feet; Sierra Nevada, 1000 to 5000 feet, from Tulare Co. to eastern Siskiyou Co.; upper Sacramento Valley, 250 to 1000 feet; North Coast Ranges, 600 to 2000 feet, from Santa Clara Co. to Trinity Co. North to Washington and Idaho. May-Aug.

Field note.—The corolla in Scutellaria angustifolia is markedly gaping; the erect galea is incurved above, its apex standing well above and somewhat over the horizontal floor of the lower lip; the middle lobe of lower lip is concave on the under side, convex-rounded above, and spreading horizontally; the lateral lobes are very short and coiled-recurved. The upper pair of filaments is adnate to corolla higher than the lower pair. All the filaments are flattened at the middle of free portion or above, the lower pair having the inner edges ciliate, the upper pair having both edges ciliate. All four filaments lie under the upper lip on the upper side of the corolla, closely parallel, their edges cobwebby-connivent. The style lies between and behind the upper (or middle) pair of stamens, which, being hirsute on the edges, weave a web of hairs over the style and thus hold it in place. In California two varieties only occur, as noted below.

Hairiness in Scutellaria angustifolia varies in different situations from puberulent to glandular-pubescent, from lightly canescent to subglabrous. The more markedly pubescent form (var. CANESCENS Gray; fig. 423) inhabits mostly dry slopes or flats or rocky outcrops and occurs in scattered localities in the hills and mountains almost throughout cismontane California. It differs from the var. austinae only trivially in details of character but such collections as may pass for var. canescens are associated in the following list of citations. S. Cal.: Santa Rosa Mts., *Munz* 5854; Idyllwild, San Jacinto Mts., *C. V. Meyer* 173; Bear Valley, San Bernardino Mts., *Parish* 10,919. Sierra Nevada: betw. Cedar Creek and Colony Mill, Tulare Co., *Jepson* 653; Trimmer Sprs., Fresno Co., *H. P. Kelley;* Greeley Hill above Coulterville, Mariposa Co., *Jepson* 14,931; Mt. Bullion, Mariposa Co., *Jepson* 10,726; Harden Ranch, Tuolumne Co., *Jepson* 10,560; Jamestown, Tuolumne Co., *Jepson* 6310; San Andreas, *Jepson* 9916; Prattville, Plumas Co., *Platt;* Mineral, Tehama Co., *J. Grinnell;* Goosenest foothills, c. Siskiyou Co., *Butler* 1633. Marysville Buttes: near North Butte, *Ewan* 9560. Coast Ranges: Pacheco Pass, *Brewer* 1285; Arroyo Mocho, Mt. Hamilton Range, *Elmer* 4434; Butts Cañon, n. Napa Co., *Jepson* 18,903; Indian Valley (mts. e.), ne. Lake Co., *Jepson* 18,963; Hartsook, Humboldt Co., *Eastwood & Howell* 3787; Trinity River Valley at Willow Creek, *Tracy* 10,083.

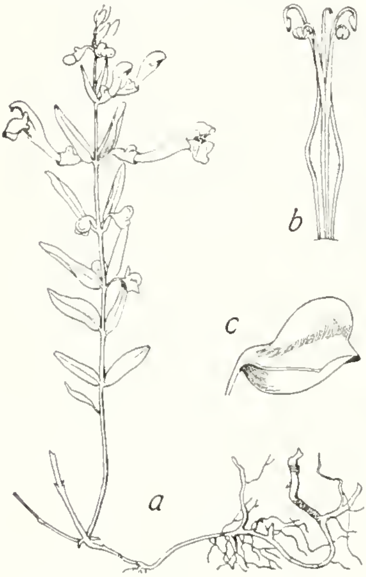

Fig. 423. SCUTELLARIA ANGUSTIFOLIA Pursh var. CANESCENS Gray. *a*, habit, × ½; *b*, stamens and style, × 1½; *c*, fr. calyx, × 2.

A less pubescent or subglabrous form (var. AUSTINAE Leonard) has velvety deep purple corollas and inhabits moist "bottoms" of streams or wet spots near springs. It does not segregate geographically from the pubescent form, var. canescens Gray, in any clear or definite manner, but is often found at somewhat higher altitudes and most often in areas of higher rainfall. The following stations are cited.—San Gabriel Mts.: Chilao, Pine Flats region, *Peirson* 1051. Sierra Nevada: Little Kern River near Trout Mdws., *Jepson* 4910. Upper Sacramento Valley: Big Antelope Creek, 2 mi. e. of Andrews road sta., Tehama Co., *Jepson* 16,624; Millville, Shasta Co., *Blankinship;* Redding, *Blankinship.*

Refs.—SCUTELLARIA ANGUSTIFOLIA Pursh, Fl. 412 (1814), type loc. Kooskoosky River, Ida., *Lewis* (specifically, opposite Kamiah; cf. Contrib. U. S. Nat. Herb. 11:488); Jepson, Fl. W. Mid. Cal. 454 (1901), ed. 2, 355 (1911), Man. 864 (1925). *S. veronicifolia* Rydb., Bull. Torr. Club 36:681 (1909), type from Ida., *Sandberg, MacDougal & Heller* 115. *S. linearifolia* Eastw., Bull. Torr. Club 30:493 (1903), type loc. San Diego, *Fisher* 586, belongs here acc. Penland, Rhod. 26:70. Var. CANESCENS Gray, Bot. Cal. 1:603 (1876), "Monterey Co. to Lake Co.," based technically on *S. siphocampyloides* Vatke, Bot. Zeit. 30:717 (1872), type from Cal., *Bridges* 226; Jepson, Man. 864 (1925). Perhaps the following belongs here: *S. viarum* Hel., Muhl. 1:32 (1904), type loc. Windsor, Sonoma Co., *Heller* 5786. Var. AUSTINAE Leonard, Contrib. U. S. Nat. Herb. 22:726 (1927). *S. austinae* Eastw., l.c. 493, type loc. Big Chico Creek, Butte Co., *C. C. Bruce* 1835.

5. **S. antirrhinoides** Benth. Stems slender, branching mostly below, 4 to 18 inches high; herbage puberulent; leaf-blades linear to oblong or ovate, entire or rarely crenulate, ½ to 1 inch long, very shortly petioled, the lowermost ovate, obtuse, 3 to 4 lines long; corolla blue, 6 to 7 lines long, its tube straight or only slightly curved, clavately widened upward into the dilated throat, the middle lobe of lower lip with a white spot thickly sprinkled with blue dots; nutlets nearly smooth.

Meadows, dry hillsides, seepages on rocky slopes or lake margins, 800 to 4000 (or 6000) feet: northern Los Angeles Co.; Coast Ranges from Alameda Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Shasta and Modoc Cos. East to Utah, north to Idaho and Washington. June-July.

Field note.—As to the biological type (prevailing form) Scutellaria antirrhinoides has shorter corollas than Scutellaria angustifolia. In Scutellaria antirrhinoides the corolla-tube is straight or nearly so, with the lower lip erect and as long as the upper lip. In the prevailing form of Scutellaria angustifolia the corolla-tube is markedly curved, with the lower lip spreading horizontally, its floor standing under the tip of the galea. Between these species there are, however, intermediate states as easily referable to one species as the other. Such states have been especially noted in the inner North Coast Range from Lake Co. to Siskiyou Co. As to position of lips one collection may exhibit both forms. The advantage in maintaining two species, where all emphasis has been brought to bear on differences and little consideration given to the heavily weighted likenesses, is doubtful.

Locs. — Northern Los Angeles Co.: Liebre Mts. (Contrib. U. S. Nat. Herb. 22: 732). Coast Ranges: Oakland Hills, *W. W. Carruth*; Indian Valley, ne. Lake Co., *Jepson* 8992; Sherwood Valley, cent. Mendocino Co., *Jepson* 1829; Covelo, ne. Mendocino Co., *Cronemiller* 623; Dobbyn Creek, s. Humboldt Co., *Tracy* 8763; Three Forks of Mad River, Trinity Co., *Tracy* 10,200; Berry's ranch, Redwood Creek, n. Humboldt Co., *Jepson* 1969; Trinity Summit, *Tracy* 14,207; Klamath River, near Terwah Creek, Del Norte Co., *R. Van Deventer* 247; Sisson, Siskiyou Co., *Jepson* 14,929. Sierra Nevada: Middle Tule River, *Purpus* 5605; Big Mdws., Plumas Co., *R. M. Austin*; Goose Valley, Shasta Co., *Peirson* 10,327; Egg Lake, Modoc Co., *M. S. Baker*.

Refs. — SCUTELLARIA ANTIRRHINOIDES Benth., Bot. Reg. t. 1493 (1832), type loc. Columbia River near Ft. Vancouver, Wash., *Scouler*; Jepson, Man. 864 (1925). *S. nevadensis* Eastw., Bull. Torr. Club 30:492 (1903), type loc. Little Lakes Cañon, Western Stampede, Elko Co., Nev., *P. B. Kennedy* 546. *S. sanhedrensis* Hel., Muhl. 1:31 (1904), type loc. Summit Lake, Mt. Sanhedrin, Lake Co., *Heller* 5894. *S. antirrhinoides* var. *sanhedrensis* Leonard, Contrib. U. S. Nat. Herb. 22:732 (1927).

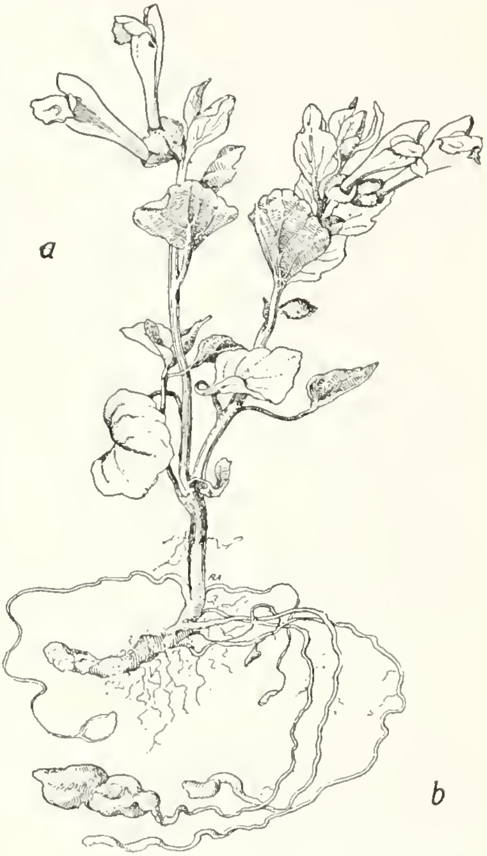

Fig. 424. SCUTELLARIA TUBEROSA Benth. *a*, habit; *b*, tubers. × 1.

6. **S. tuberosa** Benth. DANNIE'S SKULL-CAP. (Fig. 424.) Stem 2 to 5 (or 8) inches high, arising from tuberous rootstocks, the tubers oblong, 3 to 8 lines long; herbage (especially stems and petioles) pilose to puberulent; blades of the basal and lower leaves oval, thin, entire or few-toothed, 4 to 12 lines long, purplish beneath, on petioles as long as the blade, those of the upper cauline ovate, the petioles commonly short; calyx hirsute or pubescent; corolla violet-purple, 7 to 9 lines long; middle lobe of lower lip somewhat spreading, much larger than the galeate upper lip; nutlets muricate.

Loamy soil of shady woods, under open brush in the hills, on "burns," or on floors of sandy valleys, 500 to 5000 feet: Sierra Nevada foothills from Shasta Co. to Tulare Co.; upper Sacramento Valley; Coast Ranges (mostly near the coast, Humboldt Co. to San Luis Obispo Co.); coastal Southern California. South to northern Lower California, north to southern Oregon. Mar.-May.

Locs.—Sierra Nevada foothills: Ydalpom, Shasta Co., *McAllister*; Big Chico Creek, Butte Co., *Heller* 11,231; Rich Gulch, Plumas Co., *Follett*; Columbia, Tuolumne Co., *A. L. Grant*; Hodgdon ranch, near Tuolumne Grove, *Jepson* 10,538; Woody (2¼ mi. e.), Greenhorn Mts., *C. N. Smith* 341. Upper Sacramento Valley: Oak sta., 9 mi. s. of Redding, *Blankinship*; College City, *Alice King* (this seems an improbable station). Coast Ranges: Mt. Bally, Trinity Co., *Kleeberger*;

Saint Helena, *Clara Hunt;* Ross Valley, Marin Co., *Jepson* 14,936; Berkeley, *Jepson* 14,937; Alameda, *Jepson* 21,243; Los Gatos, *Heller* 7288; Carmel, Monterey Co., *E. Ferguson* 328; Cambria, San Luis Obispo Co., *Rose.* S. Cal.: betw. Pelican Bay and Prisoners Harbor, Santa Cruz Isl., *Abrams & Wiggins* 100; Gaviota Pass, Santa Barbara Co., *Munz* 9317; Henninger Flats, San Gabriel Mts., *Peirson* 178; Reche Cañon, se. of Colton, *Parish;* Santa Ana Mts., *Alice King;* Witch Creek, San Diego Co., *Alderson.*

A form with densely villous calyx (var. SIMILIS Jepson) occurs as follows.—Coast Ranges: Phillipsville, South Fork Eel River, *Tracy* 5472; Longvale, cent. Mendocino Co., *Tracy* 6221; South Mill Creek, Ukiah, *Jepson* 9260; Napa Range, e. of Napa, *Howell* 6059; Mt. Diablo, *Jepson* 9217. Sierra Nevada: Pacific House, Eldorado Co., *K. Brandegee;* Calaveras Big Trees, *A. L. Grant;* Kinsley, Mariposa Co., *C. M. Hoak.*

The var. similis Jepson is not here thought to be of much moment, but the following note is commended to the attention of field investigators: There has recently been segregated by C. Epling (Madroño 5:52–55,—1939) a subsp. similis (Jepson) Epling with hairy corolla palate and tube glabrous within below middle (Coast Ranges from Santa Clara Co. north to Siskiyou Co. and Sierra Nevada from Mariposa Co. north to Shasta Co.); and a subsp. australis Epling (typical S. tuberosa) with glabrous corolla palate and tube hairy within below middle (Coast Ranges from Alameda Co. to Monterey Co. and coastal Southern California). It is well to indicate that the stations cited as "intermediates" under subsp. australis are equally numerous with the stations cited as subspecies australis and that these "intermediates" range from Mendocino Co., the Sacramento Valley and the San Joaquin Valley to Los Angeles Co., a distribution within California more extensive than the subspecies australis and not only extending much further north and east, but also covering most of the range of the subspecies. The problem has a peculiar interest.

Refs.—SCUTELLARIA TUBEROSA Benth., Lab. Gen. et Sp. 441 (1834), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 454 (1901), ed. 2, 354 (1911), Man. 865 (1925). *S. pilosiuscula* Nutt.; Benth. in DC., Prodr. 12:429 (1848), Santa Barbara, *Nuttall. S. tuberosa* subsp. *australis* Epling, Madroño 5:54 (1939). Var. SIMILIS Jepson, Fl. W. Mid. Cal. 454 (1901), type loc. Palisades, Pope Valley grade e. of Calistoga, *Jepson* 14,940; ed. 2, 355 (1911), Man. 865 (1925). *S. tuberosa* subsp. *similis* Epling, Madroño 5:54 (1939), the var. similis Jepson, extended.

SCUTELLARIA LATERIFLORA L., Sp. Pl. 598 (1753), "in Canada, Virginia"; Jepson, Fl. W. Mid. Cal. ed. 2, 355 (1911), Man. 863 (1925). Mad-dog Skullcap. Stem erect, freely branched, strongly channeled, 1 to 2 feet high; herbage puberulent or subglabrous; leaf-blades ovate to ovate lanceolate, acuminate, coarsely serrate, 1 to 2 inches long, on slender petioles 1 to 9 lines long; flowers in one-sided racemes, the racemes axillary and sometimes also terminal, 1 to 2½ inches long; calyx papery-capsular in fruit, puberulent; corolla 2 to 3 lines long, the lips short, equal.—Bouldin Isl., lower San Joaquin River, in 1892 (Zoe 4:215); not re-collected since in Cal. Oregon to British Columbia, east to Newfoundland and Florida.

7. **S. nana** Gray. DWARF SKULLCAP. Stems somewhat tufted, densely leafy, 2 to 3 inches high, arising from slender moniliform tubers; herbage densely puberulent; leaf-blades obovate to oblong, obtuse, entire, thickish, 4 to 8 lines long, tapering into a short (½ to 1 line) petiole; flowers 7 to 10 lines long; corolla white, rather broad, with equal lips and dilated throat, the middle lobe of lower lip concave or cupped; lateral lobes small, tending to approximate the upper lip; nutlets densely papillate.

Ashy soil of lava plateaus, 4000 to 6500 feet: Plumas and Lassen Cos. to Siskiyou and Modoc Cos. East to Nevada and Wyoming, north to Idaho. June-July.

Locs.—Chester (6 mi. w.), Plumas Co., *Keck* 1720; Pine Creek, Lassen Co., *M. S. Baker;* Bieber Range, nw. Lassen Co., *L. S. Smith;* Igerna, Siskiyou Co., *Heller* 8086; Egg Lake, Modoc Co., *M. S. Baker.*

Refs.—SCUTELLARIA NANA Gray, Proc. Am. Acad. 11:100 (1876), type loc. Winnemucca Valley near Pyramid Lake, Nev., *Lemmon;* Jepson, Man. 865 (1925).

4. **SALAZARIA** Torr.

Divaricately branched shrub with spinescent sparsely leafy branchlets. Flowers in loose spikes. Calyx oblong, with 2 very short truncate entire lips, in fruit membranous, ovate-globose, conspicuously enlarged and resembling an inflated bladder. Corolla white or lavender-tinged, 2-lipped, the middle lobe of lower lip deep purple, roundish with recurved sides, its strongly distended floor closing the throat, the small lateral lobes more connected with the erect galeate upper lip. Fertile stamens 4, the lower pair longer, the filaments slightly pubescent below. Upper fork of style very short or wanting. Nutlets depressed, roughened.—Species 1. (Don José Salazar, member of the United States and Mexican Boundary Survey Commission.)

1. **S. mexicana** Torr. Bladder Sage. (Fig. 425.) Stems several in a cluster, simple below, intricately branched above, forming a clumpy bush 2 to 4 feet high; leaf-blades oblong or ovate, commonly entire, glabrous, 3 to 12 lines long, barely petioled; calyx 4 lines long; corolla 9 to 10 lines long, pubescent outside with short reflexed hairs; fruiting calyx scarious, often purplish, ½ to ¾ inch in diameter; nutlets papillate-tessellate.

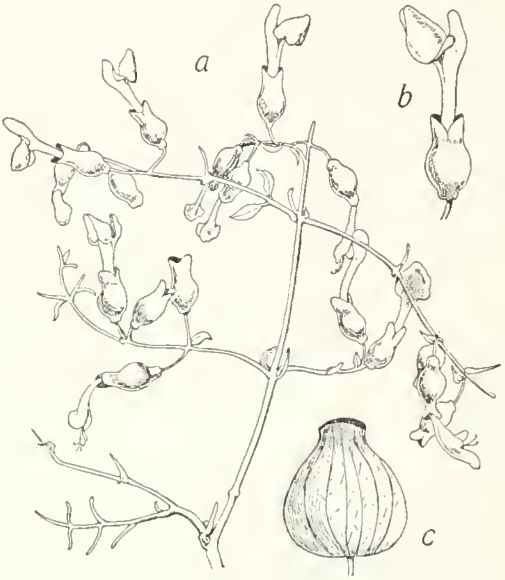

Fig. 425. Salazaria mexicana Torr. *a*, infl., × ¾; *b*, fl., × 1¼; *c*, fr. calyx, × 1.

Washes, bajadas of desert cañons, mesas and rocky slopes, 500 to 6500 feet: Inyo Co.; Mohave and Colorado deserts and the desert slopes of their bordering ranges. East to Utah, southeast to Coahuila, Mexico. Apr.-June.

Field note.—Salazaria mexicana is an erect intricately branched shrub, the individuals commonly somewhat scattered and often associated with Atriplex confertifolia, Cassia armata, Larrea tridentata, Franseria dumosa, Krameria parvifolia and Lycium andersonii. Occasionally, as in the New York Mountains, it forms dense colonies four feet high and ten feet broad. The flowering branches at the top of the shrub die the following winter and become indurated and spiny. Next season the new flowering branches are developed mostly below the spiny fringe of old growth.

Locs.—Inyo Co.: Emigrant Cañon, Death Valley, *Jepson*; Hanaupah Cañon, Panamint Range, *Jepson* 7084. Mohave Desert: Palmdale; Rock Creek, San Gabriel Mts., *Peirson* 498; Tehachapi Pass; Cajon Pass, *Jepson* 6136; Barstow, *Jepson* 5413; Ord Mt., *Jepson;* Dominguez ranch, Providence Mts., *Jepson* 18,273; New York Mts., *Jepson*. Colorado Desert: Whipple Mts., *Newlon* 555; Cottonwood Spr., near Eagle Mts., *Jepson* 12,621; Pleasant Valley near Lookout Mt., *Jepson;* Palm Cañon of Mt. San Jacinto, *Jepson* 1383; Devils Cañon, Santa Rosa Mts., *Clary* 5; Mountain Springs grade, e. San Diego Co., *Orcutt* 246.

Refs.—Salazaria mexicana Torr., Bot. Mex. Bound. 133, pl. 39 (1859), type loc. near Rio Grande, Chihuahua, *Parry;* Jepson, Man. 865, fig. 812 (1925).

5. **MARRUBIUM** L. Hoarhound

Perennial tomentose herbs with much wrinkled leaves and rather small flowers in whorls in the axils of the upper leaves. Calyx with cylindraceous tube, 10 ribs and as many equal subulate or spinulose teeth, which are recurved at tip. Corolla white, with short tube included in the calyx, the upper lip erect, 2-cleft, the lower spreading, 3-cleft. Stamens 4, included within the tube of the corolla, all the anthers 2-celled. Nutlets rounded at the top.—Species about 30, Europe, Asia and Africa. (From the Hebrew, meaning bitter.)

1. **M. vulgare** L. White Hoarhound. Stems tufted, erect, white-lanate, ¾ to 4 feet high; leaf-blades roundish, crenate, except at the cuneate or truncate base, rugose, white-woolly beneath and green above, or somewhat tomentose on both faces, petioled; middle lobe of lower corolla-lip transversely oblong, much larger than the lateral lobes.

European weed naturalized in waste places, 10 to 4700 feet: throughout California. May-Sept.

Immigration note.—The legend runs that the Franciscan friars, coming from Mexico into California in the latter part of the eighteenth century on their task of founding a chain of missions, brought with them, amongst other European garden plants, the medicinal herb, Marrubium vulgare. It is not improbable; and there is the fact of a few early day records. In the Botany of Beechey's Voyage (1838), this species is listed in the California collection made by Douglas in 1831. Bigelow gathered it at Mokelumne Hill, Amador Co., in 1854 (Pac. R. Rep. 4:123). Brewer collected it near Mt. Diablo in 1861 (no. 837). It is included in Bolander's Catalogue of Plants growing in the vicinity of San Francisco (22,—1870). After which time herbarium records become frequent: betw. Alturas and Likely, Modoc Co., *Jepson* in 1918; Salt Creek settlements, w. Tehama Co., *Jepson* in 1899; Kneeland Prairie, Humboldt Co., *Tracy* 3878 in 1912; Grand Isl., lower Sacramento River in 1891 (Erythea 1:243); Clements, San Joaquin Co., *Jepson* in 1902; Alameda, *Jepson* 14,890 in 1894; Berryessa, Santa Clara Co., *Davy* in 1900; betw. Lemon Cove and Three Rivers, *Jepson* in 1900; Cañada del Capitan, Santa Barbara Co., *Jepson* 11,913 in 1927; Santa Catalina Isl., in 1898 (Erythea, 7:98); Los Angeles, c. 1893 (Erythea, 1:98); Riverside, *Jepson* in 1901; Santa Ana, *Alice King* in 1908; San Diego, *T. Brandegee* in 1894. During the last thirty years it has become extremely common in waste lands in or about old towns in the Great Valley, Sierra Nevada foothills and Coast Ranges, sometimes forming dense thickets of a quarter of an acre or so, or belts of it may extend for miles as at Bellota in San Joaquin County. It favors a wide variety of habitats, such as dry cañon bottoms, rich valley flats, arid rocky hills, waterless mesas, moist river "bottoms" and valley marshes; and it is evergreen with us. In certain portions of the eastern United States Marrubium vulgare and Nepeta cataria, both introduced medicinal weeds, are often found associated. This is seldom or never true in California.

Refs.—MARRUBIUM VULGARE L., Sp. Pl. 583 (1753), type loc. European; Jepson, Fl. W. Mid. Cal. 455 (1901), ed. 2, 355 (1911), Man. 865 (1925).

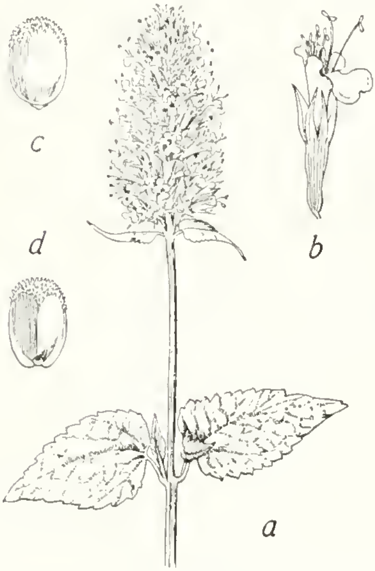

Fig. 426. AGASTACHE URTICIFOLIA Ktze. *a*, fl. stem, × ½; *b*, fl., × 2; *c*, nutlet, dorsal view, × 10; *d*, nutlet, ventral view, × 10.

6. **AGASTACHE** Clayt.

Tall perennial herbs. Leaves ovate, serrate, petioled. Flowers violet-purple or whitish, the cymes crowded in a terminal spike. Calyx tubular-campanulate, rather oblique, almost equally 5-toothed. Upper lip of corolla 2-lobed, nearly erect; lower lip spreading, its middle lobe crenate. Stamens 4, exserted, the anthers not approximate in pairs.—Species about 5, North America. (Greek agan, much, and stachus, a corn ear, in allusion to the numerous spikes.)

1. **A. urticifolia** Ktze. (Fig. 426.) Stems several to many from the base, erect, simple or with few branches above, 2½ to 5 feet high; herbage glabrous or sometimes minutely puberulent; leaf-blades triangular-ovate, truncate to subcordate at base, serrate, 1½ to 4 inches long; petioles ½ to 1½ inches long, or the uppermost ¼ inch long; calyx-teeth subulate to lanceolate, pinkish or whitish; corolla dull white or light violet-purple, 4 to 6 lines long, its lobes slightly hairy but the throat glabrous; lateral lobes of lower lip short, acute, the middle lobe short-fan-shaped, a little cupped, erosulate; filaments glabrous; style included.

Moist often sandy soil of meadows, ravines or valley floors, mostly in the mountains: San Bernardino Mts., 4000 to 5000 feet; San Luis Obispo Co., 900 to 1500 feet; North Coast Ranges, 200 to 6000 feet, from Napa and Sonoma Cos. to Siskiyou Co.; Sierra Nevada, 2500 to 8700 feet, from Tulare Co. to Modoc Co. East to Arizona and Nevada, north to Idaho and Washington. June-July.

Geog. note.—Agastache urticifolia is limited chiefly to montane areas in California where the seasonal rainfall averages 30, or more commonly, 40 to 50 or 60 inches. In Southern California it is known only from the south slope of the San Bernardino Mountains. Between this region and Sonoma County it has thus far been discovered only in the Santa Lucia Mountains near San Luis Obispo, a region marked by a 30 to 40-inch rainfall zone. There is also a 40-inch rainfall contour in Sonoma County about the lower coastal course of the Russian River, where two stations for this species are recorded. The distribution northward is also of interest. While it occurs in the Coast Ranges to the west and in the Sierra Nevada to the east of Mt. Shasta, it does not, according to present records, inhabit Mt. Shasta itself. It is thus to be included in the considerable list of species which are absent from Mt. Shasta, though found in the high ranges both to the west and to the east.

The lateral lobes of the lower lip of the corolla are of about the same shape as the lobes of the upper lip; all these lobes are erect.

Locs.—San Bernardino Mts.: Oak Glen and Potato Cañon (Pl. World, 20:252). San Luis Obispo Co.: Lopez Cañon, Santa Lucia Mts., *Condit.* North Coast Ranges: Russian River near Guerneville, *Davy* 4135; Caux's Knob, w. of St. Helena, *Jepson* 14,893; Scott Valley, Lake Co., *Jepson* 14,897; Castle Peak, ne. Mendocino Co., *Jepson* 14,891; Van Duzen River Valley, opposite Buck Mt., *Tracy* 2802; Whiskey Camp, Marble Mts., *Butler* 171; Moffett Creek, cent. Siskiyou Co., *Butler* 1533; Poker Flat, w. Siskiyou Mts., *Jepson* 18,555. Sierra Nevada: Sequoia Park, *W. Fry* 12; Bubbs Creek, South Fork Kings River, *Jepson* 782; Shadow Lake, Middle Fork San Joaquin River, *A. L. Grant* 1566; Kelty Mdw., Madera Co., *Kennedy;* Yosemite, *Jepson* 4262; Hetch-Hetchy, *Jepson;* Cow Creek, Tuolumne Co., *A. L. Grant* 67; Dorrington, Calaveras Co., *Jepson* 10,051; upper Truckee River, Eldorado Co., *H. M. Wheeler;* Sierra Valley, Sierra Co., *Lemmon;* Lost Lake, Warner Range, *L. S. Smith* 1028; Egg Lake, w. Modoc Co., *M. S. Baker.*

Refs.—AGASTACHE URTICIFOLIA Ktze., Rev. Gen. 2:511 (1891); Jepson, Man. 866, fig. 813 (1925). *Lophanthus urticifolius* Benth., Bot. Reg. sub t. 1282 (1829), type from "the northwest coast of America," *Douglas;* Jepson, Fl. W. Mid. Cal. 455 (1901), ed. 2, 356 (1911). *Vleckia urticifolia* Raf., Fl. Tellur. 3:89 (1836). *A. glaucifolia* Hel., Muhl. 1:32 (1904), type loc. Knights Valley, Sonoma Co., *Heller* 5792.

7. NEPETA L.

Perennial herbs. Calyx tubular, obliquely 5-toothed, the upper teeth longer than the lower. Corolla-tube enlarged above, distinctly 2-lipped; upper lip erect, lower spreading, the middle lobe larger than the lateral. Stamens 4, not exserted, ascending under the upper lip, the lower pair the shorter, all anther-bearing, with the anthers approximate in pairs. Nutlets ovoid, flattened, smooth.—Species 150, Europe, Asia and Africa. (Old Latin name used by Pliny, perhaps from the city Nepete in Tuscany.)

Flowers numerous, in dense spikes, the spikes paniculate; leaves triangular-ovate, white-tomentulose below....................1. *N. cataria.*
Flowers few, in axillary verticils; leaves reniform-orbicular, glabrous or nearly so..2. *N. hederacea.*

1. **N. cataria** L. CATNIP. Stems 2 to 3 feet high; herbage canescent with fine hairs, the upper surface of the leaves green, puberulent; leaf-blades triangular-ovate, truncate or cordate at base, coarsely crenate, ¾ to 1½ (or 2½) inches long, on petioles 1 to 7 lines long; spikes ½ to 1½ (or 3) inches long, dense or with 1 or 2 accessory whorls below; calyx-teeth lanceolate-subulate; corolla white, 4 to 5 lines long, dotted with purple.

Naturalized European weed, commonly near dwellings, 20 to 4000 feet: scattered localities throughout the state. July-Aug.

Locs.—Forestdale, sw. Modoc Co., *M. S. Baker;* Greenhorn Creek, near Quincy, *Jepson* 19,444; Scott Valley, Lake Co., *Jepson* 21,231 (in 1892); Mt. Konocti, Lake Co., *Jepson* 14,896 (in 1892); Russian River near Guerneville, *Davy* 4134; Santa Rosa, *Chesnut* (in 1887); Petaluma, *Chesnut;* Edgar Cañon, San Bernardino Mts., in 1872 (Zoe, 1:124); Riverside, Beaumont and Piru Creek (Bull. S. Cal. Acad. 19^4:23).

Refs.—NEPETA CATARIA L., Sp. Pl. 570 (1753), type from Europe; Jepson, Fl. W. Mid. Cal. 455 (1901), ed. 2, 355 (1911), Man. 866 (1925).

2. **N. hederacea** Trev. GROUND IVY. GILL-OVER-THE-GROUND. Stems few, slender, creeping or trailing, 9 to 24 inches long; herbage glabrous; leaf-blades reniform-orbicular, or basal sinus wholly closed, crenate, ¼ to 1 inch long; flowers

few, in axils of lower leaves, shorter than petioles; calyx not enlarged in age, the teeth triangular, subulate-tipped; corolla blue, 3 to 5 lines long.

Damp usually shaded places, 5 to 3000 feet: introduced from Europe, about towns or occasionally remote from habitation. May-June.

Locs.—Little Arthur Creek, Santa Cruz Mts., *Jepson* 9676; Bouldin Isl., San Joaquin Co., in 1892 (Zoe 4:215); Whispering Pines, sw. Lake Co., *M. S. Baker* 2237 in 1927; Fort Bragg, *W. C. Mathews* 10; betw. Freshwater and Ryans Slough, Humboldt Bay, *Tracy* 4475 in 1914; Beebe's ranch, near jct. Willow Creek and Trinity River, n. Humboldt Co., *Tracy* 3382 in 1911; Brush Creek, Butte Co., *Conger*.

Refs.—NEPETA HEDERACEA Trev., Prosp. Fl. Eng. 26 (1842); Jepson, Fl. W. Mid. Cal. ed. 2, 356 (1911), Man. 866 (1925). *Glechoma hederacea* L., Sp. Pl. 578 (1753), type European; Martyn, Fl. Rustica, pl. 61 (1792). *Nepeta glechoma* Benth., Lab. Gen. et Sp. 485 (1834).

Cedronella canariensis Willd.; Webb & Berth., Phyt. Canar. 3:87 (1836–1850). *Dracocephalum canariense* L., Sp. Pl. 594 (1753), type loc. Canary Isls. *C. triphylla* Moench, Meth. 411 (1794). Herb-of-Gilead. Sweet-scented herb 2 to 3 feet high, woody at base; leaves trifoliolate, the leaflets oblong-lanceolate, serrate; flowers in oblong spikes; corolla blue.—Garden plant, native of the Canary Islands, adventive at San Francisco: Twin Peaks, *Alice King* 3590 in 1914; Mud Lake, Parkside, *Alice King* in 1914.

8. BRUNELLA L.

Low perennial herbs, the nearly simple stems terminated by a short-spicate or subcapitate inflorescence, each whorl composed of 6 subsessile flowers and subtended by broad chartaceous floral bracts. Calyx reticulate-veiny, membranous or chartaceous, 2-lipped; upper lip truncate with 3 cusps; lower 2-cleft; lips closed in fruit. Corolla-throat inflated and tube more or less exserted; upper lip erect, galeate, entire; lower lip 3-lobed, the middle lobe hanging downward. Stamens 4, in pairs under the upper lip, each filament or those of the upper pair with a small tooth below the anther. Nutlets smooth and glabrous.—Species 6, 5 European, the following in all continents. (Old German breune or braune, an affection of the throat, which Self Heal was used to cure.)

1. **B. vulgaris** L. Self Heal. Stem 4 to 10 inches high, hirsute or hirsutulose, especially at the nodes or just below the heads, sometimes glabrate; leaf-blades lanceolate to ovate or ovate-oblong, crenate to serrate, glabrous or scantily puberulent, 1 to 3 inches long, petioled; bracts short-ciliate; corolla violet, pinkish or lavender, exceeding the purplish calyx; middle lobe of lower lip with setaceous-incised margin.

Moist woodland borders, meadows and thickets, 25 to 7400 feet: throughout cismontane California except in the dry valleys; rare in transmontane deserts. June-Sept.

Geog. note.—In California the species is mostly represented by the var. LANCEOLATA Fer., in which the leaves are mainly lanceolate to oblong and gradually narrowed or cuneate at base, and averaging one-third as broad as long, as opposed to the typical European plant with ovate leaves rounded at base, averaging one-half as broad as long. But broad leaves may be found in indigenous California plants, or even on individuals displaying broad leaves at base and lanceolate leaves above (Donner Lake, *Sonne*). Contrariwise, plants with lanceolate leaves are often found in European countries. The following localities, in the main, represent the var. LANCEOLATA Fer., though some, in collusion with intergrades, approximate the species. S. Cal.: Palomar Mt.; Mt. San Jacinto; Bluff Lake, San Bernardino Mts., *J. Grinnell* 104; Victorville, Mohave Desert, *Parish* 10,583. Coast Ranges: Boulder Creek, Santa Cruz Mts., *H. A. Walker* 827; Yountville (e.), Napa Valley, *Jepson* 9975; betw. Guerneville and Monte Rio, Russian River, *E. Ferguson*; Dimmick Park, sw. Mendocino Co., *Jepson* 17,680; Ft. Bragg, *Mathews* 54; Fish Camp, ne. Mendocino Co., *Cronemiller* 679; Eureka, *Tracy* 16,729; Trinity River Valley at Willow Creek, *Tracy* 15,370; Rush Creek, Trinity Co., *Yates* 421; Smith River town, Del Norte Co., *Jepson* 9348; Sisson, Siskiyou Co., *Jepson* 14,898. Sierra Nevada: Giant Forest, Tulare Co., *Newlon* 45; McKinley Grove, Fresno Co., *A. L. Grant* 1191; Hamilton sta., betw. Big Oak Flat and Crocker sta., *A. L. Grant* 825; Brush Creek, Butte Co., *Conger*; Martin Sprs., Eagle Lake, Lassen Co., *Brown & Wieslander* 23; Morley sta., Shasta Co., *Baker & Nutting*. In the var. ATROPURPUREA Fer., the often purplish bracts are sparsely short-ciliate or glabrous, the corollas dark or blackish-purple; it is a coastal form: betw. Jenner and Ft. Ross, Sonoma Co., *Merle Randall;* Pt. Reyes, *Davy* 6768; Crystal Springs Lake, San Mateo Co., *Elmer* 4206. Plants of gardens and town enclosures are probably direct introductions from Europe and thus true Brunella vulgaris. Such introductions are, however, often not readily separable from the indigenous var. lanceolata, but in the north coast region (teste J. P. Tracy) field distinction between the two forms is usually evident.

Refs.—BRUNELLA VULGARIS L., Sp. Pl. 600 (1753), type European; Jepson, Fl. W. Mid. Cal. 456 (1901), ed. 2, 356 (1911), Man. 867 (1925). Var. LANCEOLATA Fer., Rhod. 15:183 (1913); Jepson, Man. 867 (1925). *B. vulgaris* b *lanceolata* Barton, Fl. Phila. 2:37 (1818), type loc. Philadelphia, Pa. Var. ATROPURPUREA Fer., Rhod. 15:186 (1913), type loc. Santa Rosa, *Heller* 5639; Jepson, Man. 867 (1925).

9. SALVIA L. SAGE

Herbs or low shrubs with the flowers usually in whorls, the whorls forming terminal spikes or borne singly as terminal heads, or sometimes the flowers disposed in thyrsoid panicles. Floral leaves mostly reduced to bracts. Calyx 2-lipped, the upper lip entire or 3-toothed, the lower 2-cleft. Corolla with the upper lip erect, straight, concave or falcate, sometimes obsolete; lower lip spreading, 3-lobed, the middle lobe often emarginate, cleft or fringed. Stamens inserted in the throat of the corolla; lower pair fertile; upper pair obsolete or represented by sterile filaments or vestiges; anther-cells widely separated on a long filament-like connective longer than the filament itself and jointed to it by the middle or near one end; connective at its upper end (under the upper lip of the corolla) bearing a perfect anther-cell, at its lower end a reduced or deformed anther-cell or the anther-cell obsolete.—In some species the stamen filament, while seemingly simple, is really jointed, thus indicating the presence of the connective, the lower end of which sometimes projects at the joint as a subulate point but only rarely bears a trace of an anther-cell.—Species about 550, all continents. (Latin salveo, to save, some of the species being officinal.)

A. Filament of the stamen bearing a filament-like connective, the upper arm of the connective bearing an anther-cell, the lower arm bearing an anther or a reduced anther-cell or rudiment.

Leaves spine-tipped and spine-toothed; herbage white-woolly; bracts exceeding the calyces and often much surpassing the flowers.
  Thistle-like annual; leaves 3 to 12 inches long, forming a basal rosette; widely distributed...... 1. *S. carduacea.*
  Bushes; leaves ½ to 1½ inches long, cauline; narrow endemics of the deserts.
    Stems and leaves densely white-tomentose; calyx resembling a woolly pellet, the teeth almost obscured by the woolly covering; Death Valley........ 2. *S. funerea.*
    Stems white and leaves green, glandular-puberulent; calyx finely but somewhat obscurely glandular-puberulent, the spine-tipped teeth prominent; Colorado Desert........ 3. *S. greatae.*
Leaves not spiny; herbage green; bracts shorter than the calyces; widely distributed annual........ 4. *S. columbariae.*

B. Filament of the stamen apparently simple, really jointed, the upper anther-bearing portion being one arm of the connective, the lower arm obsolete or reduced to a slender thread or subulate point; leaves entire or merely serrate.

1. COROLLA CRIMSON; HERB; STEMS ERECT, VERY LEAFY, THE LOWER LEAVES CORDATE AT BASE; COROLLA 1¼ TO 1½ INCHES LONG........ 5. *S. spathacea.*

2. COROLLA NOT CRIMSON; SHRUBS OR BUSHES OR AT LEAST WOODY AT BASE (no. 9 an herb).

a. Bracts more or less herbaceous, at least not colored; all cismontane except no. 8; (no. 6 is also on west side of the deserts).

Corolla-tube shorter than lower lip; inflorescence thyrsoid-paniculate; floral leaves and bracts small; corolla white; S. Cal........ 6. *S. apiana.*
Corolla-tube longer than lower lip.
  Corolla white, 6 to 10 lines long; bracts more or less pointed; S. Cal.
    Bracts and calyx-teeth merely acute or cuspidate; flower whorls solitary or few; leaf-blades acute at base; cismontane San Diego Co........ 7. *S. clevelandii.*
    Bracts and calyx-teeth long-aristate; flower-whorls 5 to 10; leaf-blades truncatish or rounded at base; w. side Colorado Desert........ 8. *S. vaseyi.*

Corolla white, lilac or light-purple, 4 to 7 lines long; flower-whorls 2 to 8.
  Bracts and calyx-teeth cuspidate.
    Mat-forming herb with prostrate woody stems, the flowering stems 4 to 12 inches high, ascending, scape-like and almost leafless; corolla light violet; style and stamens long-exserted; widely distributed......................9. *S. sonomensis.*
    Shrub with dark or blackish herbage; corolla white, lilac or lavender; style and especially the stamens little exserted, or the stamens included; South Coast Ranges and coastal S. Cal..10. *S. mellifera.*
  Bracts and calyx-teeth blunt; corolla light purple; stamens and style much exserted; whole plant hoary-white; Monterey Co. to Orange Co..............11. *S. leucophylla.*

b. Bracts, upper floral leaves and 2-lipped calyx scarious-membranous, usually colored; transmontane deserts or ranges on desert borders.

Leaves spatulate or obovate, obtuse or retuse, not rugose, entire (or sparsely crenulate); bracts purplish-tinged; flower-whorls usually 2 to 4.
  Corolla 3 to 5 lines long, its tube little exceeding the calyx....................................12. *S. carnosa.*
  Corolla 9 to 12 lines long, its tube over twice as long as the calyx....................13. *S. pachyphylla.*
Leaves oblong to ovate or linear, acutish, very rugose, crenulate.
  Bracts apparently whitish; leaves small (3 to 6 or 8 lines long), of one kind, ovate; flower-whorls solitary and terminal..14. *S. mohavensis.*
  Bracts purplish or purplish-green; leaves larger (¾ to 1¾ inches long), of 2 kinds, oblong-lanceolate and linear-revolute; flower-whorls 1 to 4.... ....15. *S. eremostachya.*

1. **S. carduacea** Benth. THISTLE SAGE. Stems 1 to 6 from a basal leaf-rosette, naked and scape-like, 4 inches to 2¼ feet high, bearing 1 to 4 whorls of flowers; herbage white-woolly, the wool more or less deciduous; flower-whorls markedly woolly; basal leaves 3 to 12 inches long; leaf-blades oblong in outline, pinnatifid, with spinulose-dentate margin; bracts ovate-lanceolate or lanceolate, pectinate-spinescent, surpassing the flowers; calyx long-woolly, its upper lip strongly 3-toothed, the middle tooth larger, the lateral distant, much surpassing the lower lip; corolla light blue, deeply 2-lipped, 1 inch long; upper lip 2-cleft, the segments laciniate or denticulate at the end; lower lip with small erose lateral lobes and an exceedingly large fan-shaped and laciniately fringed middle lobe; proper filament very short.

Sandy plains, dry hills, mesas and cañon flats of interior valleys and deserts and desert borders, 25 to 4000 feet: inner South Coast Range from San Joaquin Co. to western Kern Co. and westward to the coast in San Luis Obispo Co.; San Joaquin Valley (infrequent in north part); southern Sierra Nevada in Tulare and Kern Cos.; cismontane Southern California; western Mohave Desert; western Colorado Desert. South to Lower California. May-June.

Field note.—Salvia carduacea usually occurs in colonies which are often rather clearly limited. In the lower part of the San Felipe Valley, transmontane San Diego County, it is, for example, very abundant, its well-defined colonies 8 to 40 feet across and often very dense and showy, making spots of color which continue for many miles. In Blair Valley, a short distance south, the Thistle Sage forms a zone 40 to 50 feet broad for two or three miles around Filaree Flat (Jepson Field Book, vol. 37, p. 102, 1920. ms.). Very showy colonies occur in Santa Barbara County within a few miles of the coast near Orcutt, and in Palo Prieto Pass on the hillslopes of the Temblor Range in the inner South Coast Range. Salvia carduacea is recorded as collected in the Sacramento Valley by Theodore Hartweg in 1844, but it has not since been found in that region.

A characteristic flower-stem development is as follows: The initial flower stalk is erect, arising from the flat ground-rosette of leaves. Later four additional stems arise, usually in pairs from the axils of the basal leaves. These stems are at first perfectly prostrate, but eventually, on elongating, they become ascending, each bulbous-dilated at base. A plant, therefore, typically, consists of five flower stalks, four lateral ones and an axial one in the center; or sometimes there may be only two lateral stems.

In the flower, the proper filament of the stamen is very short; as the main arm or fork of the connective it is continued upward and a bit outward or spreading and bears a large anther. The other fork of the connective is slender and stands at a right angle or nearly, bends around to the upper side of the corolla-tube, its anther lying alongside the anther on the short fork of the connective of the companion stamen. These two small anthers, therefore, lie one over the other horizontally and guard the upper side of the entrance to the corolla throat. They are about one-half the size of the larger anthers, but their cells are closely packed with pollen.

Locs.—South Coast Ranges: Corral Hollow, Alameda Co., *Jepson* 9578; Panoche Valley, e. San Benito Co., *Jepson* 18,127; Bitterwater Valley, s. San Benito Co., *Jepson;* Coalinga (foothills w.), *Jepson;* Palo Prieto Pass, Temblor Range, *Jepson* 12,021; Pismo Beach, San Luis Obispo Co., *Jones.* San Joaquin Valley: Antioch, *Chesnut & Drew;* Tracy, *Cobb;* betw. Mossdale School and Atlanta, San Joaquin Co., *Jepson* 14,941; Berenda, *Hoover* 902; Antelope Plain near Lost Hills, *Jepson;* McKittrick, *Jepson* 16,237. Southern Sierra Nevada foothills: Grapevine Spr. betw. Woodlake and Badger, Tulare Co., *Woolsey;* Weldon, Kern Co., *Voegelin* 208. Mohave Desert: Antelope Valley, n. Los Angeles Co. (Erythea 3:154); Victorville; Barstow. Cismontane S. Cal.: Orcutt, Santa Barbara Co., *Jepson;* North Pomona, *Braunton* 200; San Bernardino, *Jepson* 5594; San Jacinto, *Jepson* 1252; Temecula, *C. V. Meyer* 151; San Diego, *Spencer* 142. Colorado Desert (w. side): San Felipe Valley, *Jepson;* Box Cañon, Mason Valley, e. San Diego Co., *Jepson* 8666.

Refs.—SALVIA CARDUACEA Benth., Lab. Gen. et Sp. 302 (1833), type from Cal., *Douglas;* Hook. f., Bot. Mag. t. 4874 (1855); Jepson, Fl. W. Mid. Cal. 459 (1901), ed. 2, 358 (1911), Man. 868 (1925). *S. gossypina* Benth., Pl. Hartw. 330 (1849), type loc. Sacramento Valley, *Hartweg* 305; but not since found.

2. **S. funerea** Jones. Densely branched bush 2 to 2½ feet high; herbage white-woolly; leaf-blades ovate to ovate-lanceolate or lanceolate, often somewhat conduplicate or folded, leathery, coarsely nerved, acuminate and conspicuously spine-tipped, entire or with 1 or 2 pairs of spiny teeth on the sides, ¾ to 1½ inches long, narrowed to a short broad petiole; bracts broadly lanceolate to broadly ovate, abruptly spinose, densely and closely woolly; flowers in a leafy spike, the spike rather dense; calyx-tube cylindric, inflated, very tomentose and resembling a pellet of wool, 3 lines long, the 5 equal teeth short, cuspidate, almost wholly concealed; corolla purple, its lobes oblong or elliptic save the middle lobe of lower lip, this larger, dilated and rounded, erosulate, a little hairy on lower part; sides of upper lip turned backward; upper anther-cell somewhat declined or pendulous, the lower anther-cell horizontal and larger.

Dry hills and washes, 1000 to 2300 feet: foothills and ranges bordering Death Valley, Inyo Co. Apr.-May.

Endemism note.—Salvia funerea of Death Valley is a species of remarkable distinctness. It is even more remarkable as a narrow endemic, since it is limited to a longitudinal range of about 16 miles, as evidenced by present knowledge. The following localities may be noted: wash east of Furnace Creek ranch, Funeral Mts., *Jepson* 6891; Grotto Cañon, Tucki Mt., n. end of Panamint Range, *Hoak & Thacher;* Titus Cañon, Grapevine Mts., *Jepson* 19,852.

Refs.—SALVIA FUNEREA Jones, Contrib. W. Bot. 12:71 (1908), type loc. Funeral Mts., *Jones;* Jepson, Man. 868 (1925). *S. funerea* var. *fornacis* Jepson, l.c., type loc. Furnace Creek, Death Valley, *Parish* 10,032.

3. **S. greatae** Bdg. Shrub, 3 to 4 feet high; herbage glandular-puberulent, the stems white and the leaf-blades green; leaf-blades broadly ovate, 3 to 5-nerved, spine-tipped and bearing 1 to 3 pairs of remote or divergent spiny teeth on the sides, ½ to 1¼ inches long, sessile; flowering branches with 4 or 5 remote flower-whorls; outer bracts like the leaves, the inner becoming linear-lanceolate; calyx 4 lines long, the upper lip spine-tipped and with 2 smaller spine-like teeth near its base, the lower lip of 2 spine-tipped lobes; corolla purple, about twice as long as calyx; upper lip 1½ lines long, 2-cleft, the lobes acute; lower lip slightly longer, 3-lobed, the middle lobe fimbriate; anther of lower fork of connective half the length of the upper one and pollen-bearing.

Open sandy ground of dry washes and detrital fans, 50 to 400 feet: south side of Orocopia Mts., north side of the Colorado Desert. Feb.-Apr.

Geog. note.—Salvia greatae, an exceptionally well-marked species, is an extremely narrow endemic which is chiefly found on the bajadas and on the mesas bordering the south side of the Orocopia Mountains in the northern part of the Colorado Desert. The longitudinal east and west range, as at present known, is about 15 miles. The following localities may be cited: Dos Palmas (4 mi. n.), *Clary* 2185; Orocopia Mts. (bajada at s. base), *Clary* 2844; Cañon Sprs., *Clary* (an area about 2 miles broad); Clemens Well, Big Salt Creek wash, *Clary* 2845. At the request of the author, Marjorie D. Clary made an exploratory survey of the area inhabited by this remarkable endemic. Her report follows:

"Salvia greatae is localized in the Orocopia Mountains area on the north side of the Colorado Desert north of the Salton Sea. The main station lies above Dos Palmas Spring near the southeast base of the Orocopias. It has also been reported from the cañons back of Hidden Springs on the west side of these mountains, thus giving a longitudinal range of approximately fifteen miles. The locale of the main station is approached over a sandy wagon trail that branches off to the right from the Box Cañon highway northeast of Mecca. Dos Palmas Spring, sixteen miles beyond Mecca, is a flowing spring near the ancient Salton Sea shore line, elevation three feet below sea level. It is an uninhabited oasis characterized by scattered groups of Washingtonia filifera growing in brackish marshy ground with Scirpus, Typha and Juncus. From Dos Palmas the road follows the ancient beach line in an easterly direction across the rocky slopes. Swinging northeasterly a few miles above the spring it climbs gradually into the Big Salt Creek wash, locally known as the Big Chuckwalla. This wash separates the Orocopia Mountains from the Chocolate and Chuckwalla ranges that rise three to four thousand feet above the Salton Sea basin.

After leaving Dos Palmas, no more water is found until Clemens Well is reached, ten miles beyond. Between these two points, the main colony of Salvia greatae occurs at an elevation of 500 feet. Four miles above Dos Palmas, Peucephyllum schottii, Hoffmannseggia, and Olneya tesota begin to appear in company with Larrea, Franseria and Parosela schottii,—plants that characterize the desert vegetation of this region. The first isolated specimens of Salvia greatae come in at this point, but the main colony lies two and a half miles further on. Then for a mile and a half it is found in abundance on both sides of the wagon trail and extends one hundred and fifty yards or more on the left toward the mountains. The colony thins out as it approaches the foot of the Orocopias and only small scattered colonies occur in the narrow cañons. That it occurs in any abundance within these mountains is doubtful. Seven and a half miles from Dos Palmas the trail drops into the sandy wash of Big Salt Creek where the plants disappear altogether.

Two and a half miles beyond this main station may be found a small scattered colony growing along a narrow cañon above Clemens Well at the northwest end of the Chocolate Mountains, the elevation 800 feet. Here it occurs in association with Lycium, Krameria, Larrea, Franseria, Encelia and Atriplex hymenelytra. It was not found in cañons three and a half miles up the wash where the wagon trail becomes impassable in deep sand.

Within the heart of its large, main colony Salvia greatae is the dominant shrub, although in only a few places are the colonies pure. Parosela schottii is plentiful, often growing in close proximity. Cercidium, Olneya and Parosela spinosa occur less frequently. Hymenoclea, Larrea, and Encelia are abundant associates on the mesas, while Hyptis emoryi and Nicotiana trigonophylla appear with it as the colonies reach into the more rugged and rocky areas.

Because of the slight irregular rainfall in this region, Salvia greatae varies greatly from year to year. In dry years its general appearance is that of a low bushy plant with many spiny dead-looking branches, the brittle white ends of which often terminate in tightly whorled spirals. By the first week in April young shoots begin to appear on the ends of apparently dead branches as well as deep within the center of the bush. Blossoms appear in April, depending upon the temperature and amount of rainfall that year. In favorable seasons, when there has been adequate precipitation, the amount of new growth is materially increased and far surpasses the amount of dead wood, at which times the plants increase in height and may be found in bloom as early as the first week of April. On April 17, 1938, however, the season being dry, all the plants appeared dormant, although close inspection showed most were sending out a few new shoots. Only one small flowering spray was found. At this time the majority of the plants bore over three fourths old wood, about a half of which was dead wood. The leaves of the preceding year persist, bleaching white, but as the stems are very brittle the leaves tend to shatter if disturbed. The plants average two to four feet in height, rarely five feet. It is not uncommon to see three or more plants growing closely together and forming a dense rounded clump five or more feet in diameter. No young plants were found.

The main stems are cylindric and average one inch in diameter, branching near the ground into many spiny interlaced woody stems. There are no crown sprouts. The taproot descends deeply into the loose gravel and rocks of the bajadas, which is the preferred habitat. Because of the bushy ground-branching habit, the plants tend to garner sand about the base, the branches pushing up through the loose sand and gravel.

Salvia greatae is largely a plant of desert mesas and bajadas. Although some individuals inhabit cañons, they tend on the whole to disappear on the more precipitous slopes, and to avoid sandy washes altogether."—Marjorie D. Clary, Colorado Desert, Sept. 12, 1938.

Refs.—SALVIA GREATAE Bdg., Zoe 5:229 (1906), type loc. Cañon Springs wash, Orocopia Mts., 4 mi. ne. of Dos Palmas, Colorado Desert, *Hall & Greata* 5848 (typ. vidi); Jepson, Man. 868 (1925).

4. **S. columbariae** Benth. CHIA. (Fig. 427.) Stems 1 or several from the base, commonly simple and bearing 1 or 2 pairs of leaves and 1 or 2 (rarely 3 or 4) whorls of flowers, puberulent, 3 to 15 inches (or 2½ feet) high; leaves mostly basal or sub-basal, the blades bipinnatifid, very rugose, finely pubescent and dark green above, puberulent or tomentulose beneath, 1 to 2½ inches long, petioled; bracts ovate or more commonly orbicular and broader than long, abruptly acuminate and cuspidate-tipped, shorter than the calyces, often purple; fruiting calyx 5 lines long, oblique at the throat, its upper lip arched, crowned with a pair of needle-like

prickles, the prickle representing the middle tooth wanting (or very minute); lower lip very much shorter, the teeth represented by 2 shorter prickles; corolla blue, little exceeding the calyx, its upper lip emarginate, its lower lip with small lateral lobes and a larger somewhat 2-lobed middle one.

Mesas, desert washes, hillslopes and gravel benches of cañons, 50 to 5700 feet: Coast Ranges from Mendocino Co. to San Luis Obispo Co., including also the foothills on west side of the Sacramento Valley from Tehama Co. to Solano Co.; Marysville Buttes; Sierra Nevada foothills from Calaveras Co. to Kern Co.; Inyo Co.; Mohave and Colorado deserts; cismontane Southern California. South to Lower California, east to Arizona and Nevada. Mar.-May.

Geog. note.—Throughout the South Coast Range country and in cismontane Southern California, Salvia columbariae, the nutlets of which form an important element in the pinole of the native tribes, is a common and widely distributed springtime annual, where it tends to favor gravelly slopes or flats or broken ground. It is also distributed extensively throughout the Mohave Desert and grows luxuriantly in Owens Valley, Inyo County. Species which have so wide an area, ranging through several different climatic regions without change of character, possess an especial interest. On the Essex plain, stretching towards the Mid Hills in the eastern Mohave Desert, Salvia columbariae is, for example, a common species in the annual flora. Yet these plants of the desert flats are in aspect, habit and inflorescence indistinguishable from plants growing in the North Coast Ranges on Bartlett Mountain at about 4000 feet or on the margins of the Redwood belt near Ukiah, a region separated by more than one climatic area from the eastern deserts.

In the Sacramento Valley region Salvia columbariae has been little known. In all probability it does not inhabit anywhere the proper flood-plain loam soil floors of the Sacramento Valley, but is doubtless more common in the bordering foothills than the records show. Up to the year 1935 it was known by collections from only three stations, the Marysville Buttes and two localities in the foothills on the western rim of the valley, namely Rosewood in Tehama County and Dunns Peak near Vacaville. Since then a few stations have been added in the inner Coast Range foothills, but thus far no definite locality has been reported in the Sierra Nevada foothills from Calaveras County to Shasta County.

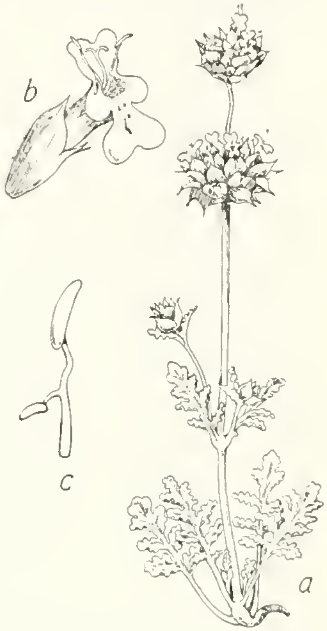

Fig. 427. SALVIA COLUMBARIAE Benth. *a*, habit, × ⅓; *b*, fl., × 1½; *c*, stamen, × 5.

Locs.—Coast Ranges: Bartlett Mt., n. Lake Co., *Jepson* 18,916; Ukiah, *Bolander* 3884; Berkeley, *Bioletti;* Mt. Diablo, *Jepson* 9661; Mt. Hamilton (Erythea 1:95); Paicines, San Benito Co., *Jepson* 12,401; Carmel Bay, *Elmer* 4891; San Luis Mt., San Luis Obispo Co., *Summers* 668; Diablo Range, sw. Fresno Co., *Jepson* 15,396. Foothills on west side of the Sacramento Valley: Rosewood, sw. of Red Bluff, *Jepson* 14,942; Paskenta, sw. Tehama Co., *Virginia L. Bailey;* Leesville (ridge e.), sw. Colusa Co., *Hoover* 3228; Dunns Peak, Vaca Mts., *Jepson* 14,944. Marysville Buttes: South Butte, *Jepson* 14,943. Sierra Nevada foothills: below San Andreas, acc. *L. S. Smith;* Knights Ferry, Stanislaus Co., *Sanford* 170; foothills in Mariposa Co. (Zoe 3:33); betw. Oak Flat and Badger, Tulare Co., *H. P. Kelley;* Bodfish, Kern Co., *Jepson.* Cismontane S. Cal.: Purisima Hills, Lompoc, *Jepson* 12,659; Sycamore Cañon, Santa Inez Mts., *Jepson* 9128; Santa Rosa, Santa Cruz and Santa Catalina islands (Zoe 1:143); San Clemente Isl., *Nell Murbarger* 130; Arroyo Seco, San Gabriel Mts., *Peirson* 335; San Bernardino, *Parish;* Santa Ana Mts., *Alice King;* Aguanga, sw. Riverside Co., *Jepson* 19,205; Mesa Grande, San Diego Co., *E. Ferguson* 8; Mt. Soledad, near La Jolla, *Newlon* 324. Inyo Co.: Silver Cañon, White Mts., *Heller* 8340; Bishop, *W. A. Chalfant;* Johnson Cañon, Panamint Range, *Jepson* 19,631; Slate Range, *Allison Krames.* Mohave Desert: Old Dad Mts., *Jepson* 20,422; Saltdale, *Jepson* 19,514; Coolgardie, n. of Barstow, *Jepson* 4825; Antelope Valley, *Davy* 2662. Colorado Desert: Cottonwood Spr., Eagle Mts., *Jepson;* Indian Wells, Coachella Valley, *Newlon* 431; San Felipe Valley, *Jepson;* Vallecito, e. San Diego Co., *Jepson.*

Refs.—SALVIA COLUMBARIAE Benth., Lab. Gen. et Sp. 302 (1833), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 459 (1901), ed. 2, 359 (1911), Man. 868, fig. 814 (1925).

The two following species are introduced aliens; the filaments of the stamens are very short and the connectives long with unequal arms; the short lower arms are conspicuous, dilated and joined at tip in a pair:

Salvia verbenaca L., Sp. Pl. 25 (1753), type European. Eye-seed. Perennial herb, the stems 1 to 2 feet high, villous; leaves chiefly basal, petioled, subglabrous, the blades ovate, sinuately lobed, denticulate, 2 to 4 inches long, the cauline sessile; flowers in a panicle; calyx 3 lines long, accrescent; corolla magenta, inconspicuous, 4 lines long.—Adventive from Europe, waste places and vacant lots: Berkeley, first noticed by S. B. Parish in 1921.

Salvia aethiopis L., Sp. Pl. 27 (1753), "habitat in Illyria, Graecia, Africa." Plants 1 to 3 feet high, often bushy; herbage tomentose, more or less glabrate; leaves mostly basal; leaf-blades ovate to orbicular in outline, irregularly serrate and shallowly lobed, 3 to 8 inches long; flowers in a terminal widely spreading panicle, the branches of the panicle with distinct whorls of flowers, the bracts conspicuous, suborbicular, abruptly subulate-spinose at apex; corolla white, the middle lobe of lower lip saccate.—Introduced from the Old World, in fields, streets and ditchbanks of old towns, 4000 to 4500 feet: Lassen Co. (Susanville, *T. Brandegee*, in 1892) and Plumas Co. (Greenville, *Clemens*, in 1919; Indian Valley, *Eastwood*, in 1927).

5. **S. spathacea** Greene. Cañon Sage. (Fig. 428.) Coarse herb with erect simple stems 1½ to 3½ feet high; herbage (especially the stems and petioles) very viscid and glandular-pubescent or -villous; leaf-blades broadly oblong-ovate, at base broadly triangular-cordate or -truncate, more or less doubly crenate or crenulate, upper surface dark green and rugulose, under surface whitened with a close short tufted tomentum (obscuring the minute red glands), 4 to 8 inches long, on petioles 2 to 3 inches long or some of the cauline sessile; whorls of flowers 5 to 22, subtended by broadly ovate or ovate-lanceolate membranous purplish bracts; calyx strongly veined, laterally compressed but somewhat inflated, 1 inch long or over, ½ inch wide at the broadest part, spathe-like, deeply slit in front between the two cuspidate-tipped teeth, the upper concave lip much larger, 3-dentate with the middle tooth largest; corolla crimson, 1¼ to 1½ inches long; upper lip short, nearly erect, subdeltoid, emarginate; lower lip spreading, the lateral lobes short, triangular, acute, the middle lobe much developed, broadly obcordate, 4 lines broad; stamens much exserted; lower fork of the connective capillary, 1 line long; rudiments of sterile stamens obvious.

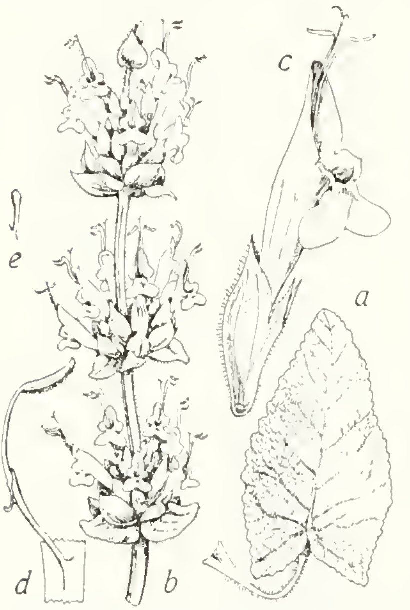

Fig. 428. Salvia spathacea Greene. *a*, leaf, × ¼; *b*, fl. branchlet, × ¼; *c*, fl., × 1¼; *d*, stamen, × 2; *e*, sterile filament, × 2.

Chaparral hillslopes and by streamlets in cañon bottoms, 10 to 2000 feet: Vaca Mts.; coastal Marin Co.; South Coast Ranges from Contra Costa Co. to San Luis Obispo Co.; coastal region from Santa Barbara Co. to Orange Co. Apr.-May.

Field note.—Salvia spathacea is one of the more remarkable plants in the Californian flora. While having a fairly wide distribution in the coastal region it is nowhere abundant. Often destroyed by the advancing settler, it has the capacity on clearings to reproduce freely by root-crown sprouts. The ample leaves are borne in a dense zone on the lower part of the erect stem; in age they turn down, forming a reversed tuft,—that is, when the plant is in the fruiting stage. The folk generally admire its form, but even sedate botanists remember its richness of color and a certain opulence of habit in contrast with its chaparral habitat.

Locs.—Vaca Mts.: Weldon Cañon, *Jepson;* Gates Cañon, *Jepson* 553. South Coast Ranges: Mt. Diablo, *Bioletti;* Colma Cañon, n. San Mateo Co., *Jepson* 9107; Nacimiento River, w. of Jolon, Monterey Co., *Jepson;* Port Harford, San Luis Obispo Co., *N. K. Berg.* S. Cal.: Surf (5 mi. s.), Santa Barbara Co., *R. S. Ferris* 7575; Cañada del Capitan, Santa Barbara coast, *Jepson* 11,910; San Marcos Pass, Santa Inez Mts., *Jepson* 12,142; Rattlesnake Cañon, Santa Inez Mts., *Jepson* 9143; Ojai Creek, Ventura Co., *Wood & Jones;* Mandeville Cañon, Santa Monica Mts., *Clokey & Templeton* 4481; Sherman, Los Angeles Co., *Braunton* 365; Orange Co. (Bull. S. Cal. Acad. 26:21).

Refs.—Salvia spathacea Greene, Pitt. 2:236 (1892); Jepson, Fl. W. Mid. Cal. 460 (1901), ed. 2, 360 (1911), Man. 869 (1925). *Audibertia grandiflora* Benth., Lab. Gen. et Sp. 312 (1833), type from Cal., *Douglas*. *Audibertiella grandiflora* Briq., Bull. Herb. Boiss. 2:73 (1894). *Ramona grandiflora* Briq., l.c. 440 (1894); not S. grandiflora Etlinger (1777).

6. **S. apiana** Jepson. California White Sage. (Fig. 429.) Shrubby, evergreen, 3 to 5 (or 10) feet high, branches virgate; leaf-blades oblong to elliptic, 1 to 4 inches long, serrulate or subentire, mostly very white pannose-pubescent above and below, short-petioled; panicle virgate, 1 to 4 feet long; corolla white or pale lilac, 6 to 9 lines long, the tube short (2 to 3 lines long); upper lip very short or almost obsolete, the lower lip much developed, the conspicuous palate curved upward so as to close the throat; middle lobe fringed, the lateral lobes small; style and stamens long-exserted.

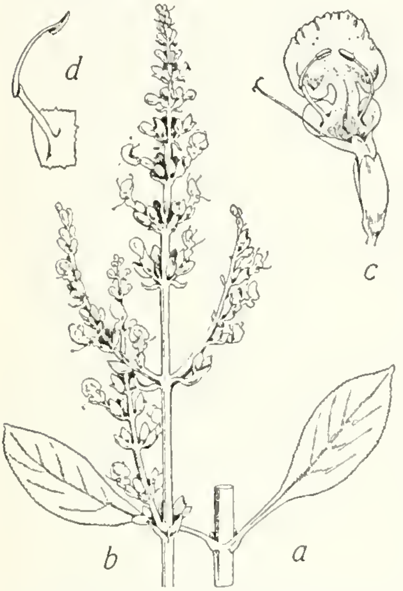

Fig. 429. Salvia apiana Jepson. *a*, lower leaves, × ⅓; *b*, panicle, × ⅓; *c*, fl., × 1½; *d*, stamen, × 2½.

Dry hills, rocky slopes, mesas and cañon floors, 500 to 4250 (or 5000) feet: cismontane and intramontane Southern California from Santa Barbara Co. and northern Los Angeles Co. to San Diego Co. Northern Lower California. May-July.

Biol. note.—For the botanical traveler Salvia apiana is a striking shrub that endows with marked interest the cañon floors, mesas and open hills of cismontane Southern California. The wand-like flowering stems, ending above in a terminal racemose panicle, arise from a woody white-leafy base, diverge a little, and make handsome plants 5 to 10 feet high. These flowering stems are nearly naked and much exceed the sterile leafy shoots massed on the lower part of the plant. Everywhere such individuals diversify the vegetation of washes and rocky flood-stream bottoms; they enter the chaparral and are also found on the borders of pure formations of Adenostoma fasciculatum or mingled with the tall flowering stalks of Yucca whipplei on cañon slopes. They may become very large. On the flat three miles south of Aguanga a shrub with 125 shoots from the base was, in 1939, 13 feet broad and 10 feet high.

This species is an important bee-food plant. The upper lip of corolla is very short, inconspicuous, and deflexed over mouth of corolla-tube; the stamens are set well out on the palate of the lower lip. Bees alighting on the flowers bear down on the palate by their weight so as to thrust their tongues into the tube. They are not influenced by the color or age of the corolla; one that is brown-wilted is entered as readily as a fresh white one; but if the flower is past anthesis, the stamens and style no longer functional, they leave it almost instantly. In favorable situations each stand of bees will yield about one hundred pounds of White Sage honey in a season. The honey is extremely clear and white. By the Diegueno Indians the plant was called kaw-se-é-tl. They harvested the seed for food. (Cf. Jepson Field Book, 27:99,—1913; 30:160,—1914; 37:127,—1920. ms.)

Locs.—Cismontane S. Cal.: Billiard Flats, Santa Inez River, Santa Barbara Co., *A. L. Grant* 1676; Santa Catalina Isl. (Erythea 7:139); Mt. Lowe foothills, *Peirson* 180; San Gabriel Cañon, San Gabriel Mts., *C. E. Hutchinson;* Cajon Pass, *Jepson;* San Bernardino, *Jepson* 5557; San Jacinto Lake (hills near), *Jepson* 1238; San Pasqual Valley (hills e.), *Jepson;* Hot Springs Mt., San Diego Co., *Jepson;* Santa Ysabel, *Jepson;* Witch Creek, San Diego Co., *Alderson*. Intramontane S. Cal. (on mountain slopes and foothills facing the western Mohave Desert and western Colorado Desert): Leonis Valley, n. Los Angeles Co., *Davy* 2640; Big Rock Creek, n. slope San Gabriel Mts., *Munz* 6881; West Cañon, Mt. San Jacinto, *L. D. Copeland;* Collins Valley, ne. San Diego Co., *Jepson;* Wagon Wash, below San Felipe Valley (near Sentenac Cañon), *Jepson* 12,510; Box Cañon, Mason Valley, *Jepson* 8705; Mountain Sprs. (summit above), e. San Diego Co., *Jepson*.

Var. **compacta** Munz. Inflorescence an interrupted spike of globose whorl-like clusters, compacted, the flowering branchlets short.—Northwest arm of the Colorado Desert, near Morongo Pass. South to northern Mexico.

Refs.—Salvia apiana Jepson, Muhl. 3:144 (1908), Fl. W. Mid. Cal. ed. 2, 359 (1911), Man. 872 (1925). *Audibertia polystachya* Benth., Lab. Gen. et Sp. 314 (1833), type from Cal., *Douglas*.

Ramona polystachya Greene, Pitt. 2:235 (1892). *Audibertiella polystachya* Briq., Bull. Herb. Boiss. 2:73 (1894); not S. polystachya Ortega (1800). *S. californica* Jepson, Fl. W. Mid. Cal. ed. 1, 460 (1901), not S. californica Bdg., Proc. Cal. Acad. ser. 2, 2:197 (1889). Var. COMPACTA Munz, Bull. S. Cal. Acad. 26:25 (1927), type loc. Morongo Wash, Riverside Co., *Munz & Johnston* 5170.

7. **S. clevelandii** Greene. JIM SAGE. Shrub 1 to 2 feet high; herbage canescent, or the leaves white-tomentulose beneath; leaf-blades oblong or the upper oblanceolate-oblong, obtuse, rugulose above, ¾ to 1¼ inches long; flowering branches peduncle-like (the leaves remote and reduced), bearing a solitary terminal head-like flower-whorl or sometimes 2 or 3 approximate whorls, or sometimes the peduncle branched, each branch with a solitary terminal whorl; bracts ovate or oblong, mucronate or abruptly short-pointed, viscid-pubescent; calyx viscid-pubescent, the lower teeth short and subulate, the upper lip entire and cuspidate-tipped; corolla white (or blue-violet), 7 to 9 lines long, well exserted from the gibbous calyx.

Chaparral slopes, 100 to 3500 feet: cismontane San Diego Co. South to northern Lower California. May-July.

Locs.—Rincon grade (summit), *C. V. Meyer* 792; Valley Center, *C. V. Meyer* 246; Witch Creek, *Alderson;* Santa Maria near Ramona, *Parish* 434; Descanso, *Parish* 4424; San Diego, *Spencer* 130; Cottonwood grade near Potrero, *Abrams* 3744.

Refs.—SALVIA CLEVELANDII Greene, Pitt. 2:236 (1892); Jepson, Man. 871 (1925). *Audibertia clevelandii* Gray, Proc. Am. Acad. 10:76 (1874), type loc. mts. behind San Diego, at about 2200 ft., *Cleveland* (the precise locality Ballena, 7 mi. e. of Ramona,—ms. note by Cleveland). *Audibertiella clevelandii* Briq., Bull. Herb. Boiss. 2:73 (1894). *Ramona clevelandii* Briq., l.c. 440 (1894).

SALVIA PALMERI Greene, Pitt. 2:236 (1892); Jepson, Man. 871 (1925). *Audibertia palmeri* Gray, Bot. Cal. 1:601 (1876), type loc. Tighes ranch, near Ballena, San Diego Co., *Palmer. Audibertiella palmeri* Briq., Bull. Herb. Boiss. 2:73 (1894). *Ramona palmeri* Briq., l.c. 440 (1894). Palmer Sage. Shrubby, 3 to 5 feet high; leaf-blades oblong to oblong-lanceolate, obtuse or acute, tomentulose-canescent, 1 to 2 (or 3) inches long; flower-whorls remote, disposed in panicles or sometimes in virgate spikes, the inflorescence leafless or with very much reduced leaves; bracts oblong or lanceolate, slender-cuspidate or acuminate, purple within, the color obscured by the pubescence without, 3 to 6 lines long; calyx slightly inflated, the throat nearly closed, very oblique, the upper lip acute, 1 to 3-mucronate, the very short lower teeth cuspidate; corolla white, 5 to 7 lines long, the tube well exserted.—Chaparral slopes, 100 to 3500 feet: cismontane San Diego Co. June-July.

In its characters, Salvia palmeri stands as an intermediate between Salvia clevelandii and Salvia apiana and has been regarded by many field botanists as a hybrid between these two species. It is most frequently found in association with Salvia clevelandii and Salvia apiana. It occurs at the following stations: Tighes ranch betw. Ramona and Ballena, *T. Brandegee;* Descanso grade, *K. Brandegee;* Alpine, *Epling;* La Jolla (Bull. S. Cal. Acad. 26:26). For note on a plant cultivated by C. B. Wolf, see Rancho Santa Ana Bot. Gard. Rep. 9:35 (1939).

8. **S. vaseyi** Parish. Shrub, 3 to 5 feet high, the flowering branches virgate; stems puberulent, the leaves white with a close dense scurf and a minute puberulence; leaf-blades round-ovate to quadratish-ovate, truncatish or very rounded or even subcordate at base, obtusish or subacute at apex, 1 to 1¾ inches long, the petioles ⅓ to ⅔ as long; upper leaves obtuse or subacute at base, only the lower leaves rugose-venulose; flower-whorls 5 to 10 in an unbranched spike, the whorls remote; bracts and calyx-teeth long-aristate; corolla white, slender, 6 to 10 lines long; upper lip short, notched, its lobes rounded; lower lip longer than upper, spreading, its middle lobe developed into a transversely oblong structure which is notched and which nearly conceals the short lateral lobes.

Rocky alluvial terraces or bajadas about desert cañons, 600 to 3000 feet: west side of Colorado Desert. South to northern Lower California. Apr.-June.

Flower note.—The stamens in Salvia vaseyi are very erect and very conspicuous. The short upper lip of the corolla is erect; though short it is much longer than in Salvia apiana. The corolla-tube much surpasses the calyx, while in Salvia apiana the corolla-tube is equaled by the calyx. The stamens are inserted low on the borders of palate of lower lip, that is near the corolla-tube, while in Salvia apiana they are inserted well out on the palate of the lower lip, some distance from the corolla-tube.

Locs.—Piñon Well, near Lookout Mt., Conchilla Range, *Jepson* 5998; Morongo Wash, e. base San Bernardino Mts., *Parish* 3233; Palm Cañon of Mt. San Jacinto, *Jepson* 1380; Yaqui Well, betw. Sentenac Cañon and San Felipe Narrows, w. Colorado Desert, *Jepson* 12,511; Palm Cañon of Mt. San Ysidro, *Duran* 3177; near Mountain Sprs., w. Imperial Co., *Meyer* 425.

Refs.—SALVIA VASEYI Parish, Muhl. 3:126 (1907); Jepson, Man. 871 (1925). *Audibertia vaseyi* Porter, Bot. Gaz. 6:207 (1881), type loc. Mountain Sprs., San Diego Co., *Vasey* 500. *Audibertiella vaseyi* Briq., Bull. Herb. Boiss. 2:73 (1894). *Ramona vaseyi* Briq., l.c. 440 (1894).

9. **S. sonomensis** Greene. CREEPING SAGE. Flowering branches almost leafless and scape-like, 4 to 12 inches high, ascending from a densely leafy mat-like base; leaf-blades oblong to obovate-spatulate, crenulate, green and rugulose above, whitish with a close dense tomentum beneath, 1 to 2 (or 3) inches long, on petioles $\frac{1}{3}$ to as long; flower-whorls 2 to 8; calyx like that of S. mellifera, but the prickly teeth of the larger upper lip short; corolla light violet, 5 to 6 lines long; upper lip short, of two erect or somewhat retrocurved lanceolate lobes; lower lip large, much prolonged in the direction of tube, the lateral lobes acute, short, the middle lobe with its orbicular-dilated terminal portion turned abruptly downward, its margin denticulate or somewhat fringed; upper (sterile) stamens inserted at orifice of tube, bristle-like, divergent; two lower (fertile) stamens inserted on lower lip without the orifice, ascending, straight (nearly as long as the corolla); style long-exserted.

Gravelly soil of mountain slopes and cañons, (200 or) 1000 to 6500 feet, often forming colonies: Sierra Nevada from Mt. Shasta to Mariposa Co.; Coast Ranges from western Siskiyou Co. to San Luis Obispo Co.; Cuyamaca Mts. May-June.

Geog. note.—The range of Salvia sonomensis is discontinuous. It inhabits the northern Sierra Nevada and extends by way of Mt. Shasta into the Coast Ranges as far southward as San Luis Obispo County. Thence there is a wide gap in its distribution before it recurs in the Cuyamaca Mountains in eastern San Diego County. Such a distribution recalls somewhat that of Cercis occidentalis as to its range in California. It may also be compared to Rhododendron occidentale, which inhabits the Cuyamaca and other mountains on the west side of the Colorado Desert but, like Salvia sonomensis, Cercis occidentalis and other species, does not occur in the San Bernardino and San Gabriel mountains and the high mountains of Santa Barbara County, though recurring northward in the Coast Ranges and Sierra Nevada.

The altitudinal range of Salvia sonomensis may be noted: it is found on Mt. Shasta at Niels Camp at about 6500 feet and occurs as low as the stream beds west of Calistoga on the Napa Valley floor at 300 feet. It is most commonly found in open woods or in thin chaparral. A typical habitat may be described as follows: One mile north of Pleasant Valley in the Sierra Nevada foothills of Eldorado County it is a frequent plant on a hillslope in a chaparral association of Adenostoma fasciculatum, Arctostaphylos viscida, Ceanothus cuneatus, Photinia arbutifolia, Eriodictyon californicum and Quercus wislizenii scrub. The lower portion of the slope was cleared a few years since, perhaps in 1936. On this clearing the Creeping Salvia promptly became a dominant, forming a somewhat interrupted rough mat over the entire area of about five acres where it is much more luxuriant than in the chaparral. The closely prostrate woody stems of the Salvia have this season developed very short densely leafy branchlets, on the under side of which the recently produced embryonic spikes are now concealed (Apr. 12, 1938) and are very slowly maturing until ready for marked development during the anthesis period. These spikes, very narrow in the embryonic phase, have the peculiarity at this stage that they are closely curved backward or reversed on their peduncles so as to resemble somewhat a shepherd's crook, and are, therefore quite hidden under the dense tufts of leaves. The structure of corolla of Salvia sonomensis is the same as that of Salvia mellifera save the obsolete upper lip of the former; the middle lobe of the lower lip in the two species is very close.

Locs.—Sierra Nevada: Mt. Shasta, *Jepson* 14,946; Forest Ranch, Butte Co., *Heller* 11,410; betw. Lake City and Columbia Hill, Nevada Co., *L. S. Smith* 1578; Murphys Camp, Calaveras Co., *Davy* 1503; Devils Gulch, Mariposa Co., *Congdon*. Coast Ranges: Sisson, Siskiyou Co., *Heller* 8044; East Weaver Creek, Trinity Co., *Yates* 331; Lower Lake, Lake Co., *C. F. Baker* 2984; Calistoga (sw. of), *Jepson* 14,945; betw. Knights Valley and Franz Valley, e. Sonoma Co., *Jepson* 14,947; Hoods Peak, se. Sonoma Co., *Bioletti;* Fremont Peak, Gabilan Range, *Elmer* 4518; Nacimiento River, west of Jolon, Monterey Co., *Jepson* 1697; Santa Lucia Mts., San Luis Obispo Co., *Barber* 1010. Eastern San Diego Co.: Harper ranch near Cuyamaca Lake, *Epling;* Descanso, *T. Brandegee.*

Refs.—SALVIA SONOMENSIS Greene, Pitt. 2:236 (1892); Jepson, Fl. W. Mid. Cal. 460 (1901), ed. 2, 359 (1911), Man. 870 (1925). *Audibertia humilis* Benth., Lab. Gen. et Sp. 313 (1833), type from Cal., *Douglas. Ramona humilis* Greene, Erythea 1:144 (1893); not S. humilis Benth. (1833). *Audibertiella humilis* Briq., Bull. Herb. Boiss. 2:73 (1894).

10. **S. mellifera** Greene. California Black Sage. (Fig. 430.) Shrub 3 to 6 feet high, the herbaceous flowering branches very leafy at the base; leaf-blades narrowly oblong, crenulate, green and rugulose above, cinereous-tomentulose beneath, 1½ to 3 inches long, petioled; flower-whorls dense, 4 to 6 on the branchlets; leafy bracts subtending the whorls ovate to oblong, the upper much reduced; floral bracts ovate to oblong, cuspidate; lower lip of calyx very short, the 2 teeth prickly; upper lip arched, crowned by 3 short sharp teeth; corolla white or lilac-tinged and rather small, 4 to 5 (2½ to 6) lines long, the tube exserted; upper lip notched; lower lip widely and downwardly spreading, nearly twice as long as upper lip, its middle lobe transversely oblong or orbicular, emarginate and slightly denticulate or entire, joined to the main part of the lip by a narrow constriction; stamens and style little exserted; lower portion of connective in fertile stamens manifest at the joint as a short tongue-like rudiment; upper pair of stamens represented by short sterile filaments, their tips approximate.

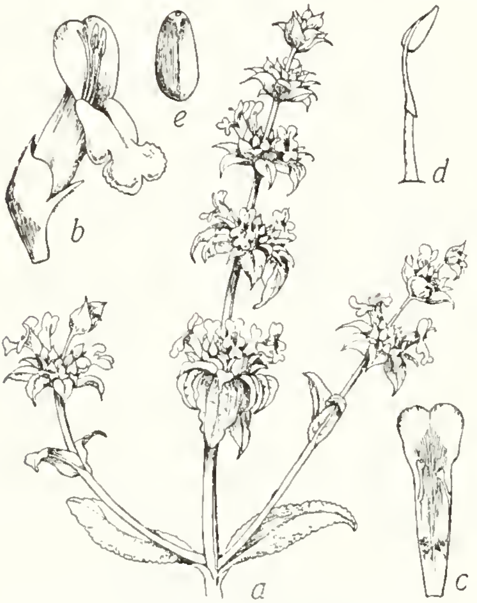

Fig. 430. Salvia mellifera Greene. *a*, fl. branchlet, × ½; *b*, fl., × 2; *c*, long. sect. of corolla, × 2; *d*, stamen, × 4; *e*, nutlet, × 3.

Hillslopes, mesas and cañon walls, often in margins of chaparral and in clearings, 50 to 2500 feet: South Coast Ranges from Contra Costa Co. to San Luis Obispo Co.; cismontane Southern California from Santa Barbara Co. to San Diego Co. Northern Lower California. Apr.-June.

Field note.—Salvia mellifera is an extremely common bush on the lower hills and mesas of cismontane Southern California where it occurs in extensive colonies or is the dominant in brush formations. Even towards the northern limits of its range, as at Rock Creek on the northern Monterey coast, the hills may be given a black tone by the dominance of this bush, thus forming a contrast with the silver of a neighboring hill closely covered by Lupinus albifrons. Well-defined though small colonies also occur in the Black Hills of Mt. Diablo, and at Somersville, the northernmost station, on the north side of Mt. Diablo. In Southern California it is strictly cismontane and is not found on the desert drainage of intramontane regions as is the case with Salvia apiana. It is a valued bee plant and is also called Button Sage. Near La Jolla grows a form with small whorls. A shrub growing in the Santa Inez Mountains near Santa Barbara has been recorded as wholly pistillate (Proc. Cal. Acad. ser. 2, 1:226,—1888). Individual shrubs, discovered in the field, have been regarded as hybrids between this species and S. apiana (San Bernardino, *Parish* 4382).

Locs.—South Coast Ranges: Mt. Diablo, *Jepson* 8330; Las Trampas Ridge, Contra Costa Co., *Jepson* 14,949; Puerto Creek, e. slope Mt. Hamilton Range, *Elmer* 4393; Glenwood, Santa Cruz Co., *Michener & Bioletti;* Pacheco Pass, *Jepson* 17,462; Big Sur River, *Jepson* 2584; Lime Kiln Creek, Santa Lucia Mts., *Jepson* 1680; Bitterwater Valley (ne. arm), San Benito Co., *Jepson* 20,244; San Luis Mt., San Luis Obispo Co., *Summers.* S. Cal.: El Jaro Creek, se. of Lompoc, *Jepson;* Sycamore Cañon, Santa Inez Mts., *Jepson* 9150; Santa Cruz Isl. and Santa Rosa Isl. (Zoe 1:143); Santa Catalina Isl.; Ojai Valley, Ventura Co., *Thacher* 44; Santa Susanna Pass, Ventura Co., *Jepson* 8465; Castaic Valley, mts. n. of, Los Angeles Co., *Jepson* 8928a; Mt. Wilson, *Peirson* 181; San Gabriel Cañon, San Gabriel Mts., *C. E. Hutchinson;* San Bernardino, *Parish* 4391; San Bernardino Valley, betw. Crafton Hills and mouth of Mill Creek Cañon, *Jepson* 5579; San Jacinto Valley (hills e.), *Jepson* 1262; Santiago Creek, Santa Ana Mts., *Alice King;* Palomar Mt., *Jepson* 1534; San Pasqual Valley (hills e.), *Jepson;* betw. Del Mar and La Jolla, *Newlon;* San Diego, *Jepson* 6657.

Var. **jonesii** Munz. Leaf-blades mostly obovate or oblanceolate, usually ½ to 1 (or 1¾) inches long; anthers shorter than the upper lip.—San Miguel Mt., sw. San Diego Co. South into Lower California.

Var. **revoluta** Munz. Compact shrub similar to the species; leaves somewhat dimorphic, the leaf-blades of the primary leaves narrowly oblong, 2 to 3 inches long, 2½ to 3 lines wide, revolute-margined, shortly petioled or subsessile, those of the leaves fascicled in the leaf-axils revolute-linear, ¾ to 2 inches long, 1 line wide, both sorts remarkably bullate, shining green and glabrous above, tomentulose beneath; flowers essentially as in the species; corolla lavender, the hairy transverse band in throat broader than in the species.—Steep cañon sides, 5 to 800 feet: Santa Rosa Isl. May.

Tax. note.—Salvia mellifera var. revoluta is narrowly endemic on Santa Rosa Island. A compact bush, it is, by virtue of this compactness, different in appearance from the species (Ruth Hartwell). The variety is, however, but slightly known; knowledge of it is in the formative stage. The notes here set down rest mainly on flowering material from a bush cultivated in the Santa Barbara Botanic Garden (*Van Rensselaer* 1029) and on the type collection (which is without flowers). The flowers resemble those of Salvia mellifera rather closely: the calyces are alike in the two; the corollas are much alike save that the tube in Salvia mellifera var. revoluta is sometimes slightly longer; the ring of hairs in the corolla-throat is broader in var. revoluta than in Salvia mellifera (where it is very narrow), but this feature is variable. The vestige of the lower arm of the stamen connective is exactly like that in the species, only somewhat more reduced. "The stamen length appears to be more or less uniform on any one plant but varies from one plant to another. On one individual the anthers are well included; on another individual they are exserted nearly half the length of the upper lip."—Field note on Santa Rosa Island by Reid Moran, 1941.

With its dimorphic leaves, var. revoluta differs from the species most strikingly in two features relating to the leaves: 1. The intervals of the reticulate venation in both sorts of leaves in var. revoluta are so strongly bullate or inflated as to resemble markedly the neatly-fitted pieces of a tesselated pavement. The venation in the species, on the contrary, is impressed only in such degree that the upper leaf surface may be described as rugose but not as tesselate, save occasionally on the margins of the leaves. 2. In var. revoluta the leaves of the axillary fascicles as a whole differ strikingly in shape from the primary leaves and differ markedly from the characteristic leaf of the species. The most definitely established differences between the mainland and insular shrubs thus rest on the leaves—characters which, in view of the close similarity of the flowers, may not seem wholly sufficient to justify specific status. The range of variation in the flower of Salvia mellifera covers essentially the features found in the flower of var. revoluta.

Refs.—SALVIA MELLIFERA Greene, Pitt. 2:236 (1892); Jepson, Fl. W. Mid. Cal. 459 (1901), ed. 2, 359 (1911), Man. 870, fig. 816 (1925). *Audibertia stachyoides* Benth., Lab. Gen. et Sp. 313 (1833), type from Cal., *Douglas;* not S. stachyoides Kunth (1817). *Audibertiella stachyoides* Briq., Bull. Herb. Boiss. 2:73 (1894). *Ramona stachyoides* Briq., l.c. 440 (1894). Var. JONESII Munz, Bull. S. Cal. Acad. 26:24 (1927), type loc. Ensenada, L. Cal., *Jones*. *S. munzii* Epling, Madroño 3:169 (1935), type loc. Hamilton ranch, L. Cal., *Epling & Robison*. Var. REVOLUTA Munz, Bull. S. Cal. Acad. 26:23 (1927). *Audibertia stachyoides* var. *revoluta* Bdg., Proc. Cal. Acad. ser. 2, 1:216 (1888), type loc. Santa Rosa Isl., *T. Brandegee;* not S. revoluta R. & P. (1798). *S. brandegei* Munz, l.c. 21:69 (1932); Epling, Ann. Mo. Bot. Gard. 25:117, pl. 20 (1938).

SALVIA BERNARDINA Parish; Greene, Bull. Cal. Acad. 1:211 (1885), type loc. San Bernardino, *Parish*. *S. columbariae* var. *bernardina* Jepson, Man. 869 (1925). Shrub 1 to 2 feet high; leaves shallowly pinnatifid, the divisions not extending more than halfway to the midrib; bracts small; upper lip of calyx tipped with 3 spine-like teeth, or these united to the end into 2 or 1.—Cañons on the north side of the San Bernardino Valley, 1000 to 2500 feet: San Bernardino, *Parish* 4383; Lytle Creek and Cajon Cañon (Bull. S. Cal. Acad. 26:27). In spite of previous varietal reference of this form to Salvia columbariae, examination and pondering of authentic material leads now to the consideration of relationship to S. mellifera. Probably there is no close connection with S. columbariae. Doubtless the explanation of this enigmatic plant is to be found in hybrid origin as suggested by P. A. Munz (Bull. S. Cal. Acad. 26:26).

11. **S. leucophylla** Greene. CHAPARRAL SAGE. SAN LUIS PURPLE SAGE. Stems woody below, leafy, white-farinose above, 3 to 4 feet high; leaf-blades oblong-lanceolate or the lowest ovate, obtuse, the upper with truncate base, finely rugulose above, white-tomentulose beneath, 1 to 3 inches long, short-petioled; flowering branches with 3 to 5 very dense head-like flower-whorls; bracts oval or oblong, densely white-farinose; calyx splitting down in front, at length emarginate behind, as if composed of two lateral lobes; corolla pink or light purple, 5 to 7 lines long, the tube hardly exserted; stamens and style much exserted; connectives almost continuous with the fertile filaments.

Dry often barren chaparral slopes, 100 to 2500 feet: Monterey Co. to Orange Co. May-June.

Field note.—In the central part of its range, as in Santa Barbara County, this shrub, Salvia leucophylla, forms colonies of three, five or ten acres extent in the hills, growing on steep westerly or northwesterly slopes. Where the conditions for it attain their optimum, it develops pure stands sharply delimited against grassland. It also occurs as individuals scattered through the chaparral or chamise, or at times becomes dominant. Near the bridge over Alamo Creek, tributary of the Cuyama River, it dominates a west slope of 40 to 45 per cent gradient,—a large colony with oak scrub scattered through it.

The two upper stamens in the flower are reduced to short sterile filaments inserted in the sinuses between the corolla lips. The corolla-tube inside is marked by a dense ring of spreading hairs above the middle. The upper lip of the corolla is erect, notched, the lower lip cleft into 3 linear-oblong lobes.

Locs.—Big Sur River, Monterey coast, *S. N. Wykoff;* Pismo Beach, San Luis Obispo Co., *Jones;* Santa Maria (5 mi. e.), *Jepson* 12,148; betw. Zaca Lake and Los Olivos, Santa Barbara Co., *Condit;* Santa Barbara, *Jepson* 12,128; Piru Creek, Ventura Co., *Wolf* 2013; Castaic sta. (mts. n. of), n. Los Angeles Co., *Jepson* 8928; San Francisquito Cañon, *Parish* 1889; Soledad Cañon, *Peirson* 412; Sespe Cañon, Ventura Co., *Peirson* 5769; Conejo Pass, Santa Monica Mts., *Jepson* 12,645; Rancho Santa Ana, near Anaheim, *Peirson* 7349.

Refs.—SALVIA LEUCOPHYLLA Greene, Pitt. 2:236 (1892); Jepson, Man. 871 (1925). *Audibertia nivea* Benth., Lab. Gen. et Sp. 313 (1833), type from Cal., *Douglas. Audibertiella nivea* Briq., Bull. Herb. Boiss. 2:73 (1894). *Ramona nivea* Briq., l.c. 440 (1894); not S. nivea Thunb. (1794).

12. **S. carnosa** Dougl. Low broad shrub 1 to 2½ feet high, 1½ to 5 feet broad; 2 or 3-year old stems with the leaves fascicled at the nodes or crowded on the short branchlets, the branchlets finely canescent; leaf-blades obovate, obtuse or retuse, entire (or sparsely crenulate), finely tomentulose-canescent, dotted with red glands, not rugose, 3 to 6 lines long, all except the uppermost gradually tapering into a petiole about as long; branchlets with 2 or 3 or 4 flower-whorls, often paniculately disposed; bracts and sessile floral leaves obovate or oval, the innermost spatulate, pubescent, ciliate, tinged with rose or purple, often equaling the calyces and completely investing them; calyx turbinate, its upper lip broad, truncatish, with 3 short teeth, the lobes of lower lip obtuse, mucronate, the cleft between its 2 lobes much deeper than between the lips; corolla deep blue, 3 to 5 lines long, its upper lip about ½ as long as the tube, cleft, its lobes erect; middle lobe of lower lip rather larger than the lateral, erosulate, notched at middle, the lateral lobes curving and approximate to it so as to form a shallow bowl; stamens much exserted, the filaments with or without a tooth at the joint, the upper pair short, sterile.

Arid mountain slopes and deserts, almost wholly transmontane, 2200 to 8000 feet: eastern Plumas Co. to Siskiyou Co. North to Washington and Idaho. May-June.

Locs.—Petes Valley, Lassen Co., *J. Grinnell;* Portola, Plumas Co., *K. Brandegee;* Soldier Creek, Warner Range, e. Modoc Co., *L. S. Smith* 929; Anderson Ferry, Klamath River, near Yreka, *Butler* 177.

Var. **pilosa** (Gray) Jepson. Upper part of stem and entire inflorescence distinctly glandular-villous or hirsutulose-pubescent; leaf-blades mostly spatulate to suborbicular or flabelliform, 2 to 5 (or 8) lines long, gradually or abruptly contracted into a petiole ½ to as long; flower-whorls 2 to 5, more closely approximate than in the species; bracts shorter than calyces, not obscuring them, pilose-ciliate, the upper side thinly pilose; upper calyx-lip short, rounded, emarginate, the 2 lower (lateral) lobes lanceolate.—Open deserts and broad cañon floors, 2000 to 5500 feet: Mohave Desert and its bordering ranges; Conchilla Range at east end of the San Bernardino Mts.; north through Inyo and Kern Cos. to Mono Co. Apr.-May.

Locs.—Arrastre Cañon, near Soledad Cañon, San Gabriel Mts., *Peirson* 392; Rock Creek (Erythea 2:62); Swartout Cañon, San Gabriel Mts., *Parish* 1909; Cajon Pass (desert side), *Jepson* 6132; Rock Sprs., Arrastre Cañon, San Bernardino Mts., *Palmer* 358; Lost Horse Cañon, n. side Conchilla Range, *Clary* 1584; Waterloo Wash, Old Dad Mts., *Jepson* 20,526; Mitchell Caverns, Providence Mts., *Jepson* 18,219; New York Mts., *Jepson* 5435; Summit road sta., betw. Halloran Sprs. and Windmill road sta., e. Mohave Desert, *Jepson* 15,807; Hanaupah Cañon, Panamint Range, *Jepson* 6957; Surprise Cañon, Panamint Range, *R. S. Ferris* 7975; Argus Mts., Inyo Co., *Purpus* 5414; Mazurka Cañon, Inyo Mts., *Mark Kerr;* Erskine Creek, Piute Mts., Kern Co., *Purpus* 5458; Walker Pass (e. side), *Jepson* 19,876; Topaz, Mono Co. (Ann. Mo. Bot. Gard. 25:132).

Refs.—SALVIA CARNOSA Dougl.; Benth., Bot. Reg. sub t. 1469 (1831), type loc. plains of the Columbia River near Priests Rapid, *Douglas;* Jepson, Man. 869 (1925). *Audibertia incana* Benth.; Lindl., Bot. Reg. t. 1469 (1831), based on Salvia carnosa Dougl. in herb. *Audibertiella incana* Briq., Bull. Herb. Boiss. 2:73 (1894); not Salvia incana Mart. & Gal. (1844). Var. PILOSA Jepson, Man. 870 (1925). *Audibertia incana* var. *pilosa* Gray, Syn. Fl. ed. 2, 2:461 (1886), type loc. Mohave Desert edge of San Bernardino Mts., *Parish. S. pilosa* Merriam, N. Am. Fauna 7:322 (1893), in part. *Ramona pilosa* Abrams, Bull. N. Y. Bot. Gard. 6:443 (1910). *S. carnosa* subsp. *pilosa* Epling, Ann. Mo. Bot. Gard. 25:133 (1938). *S. carnosa* subsp. *argentea* Epling, Ann. Mo.

Bot. Gard. 25:131 (1938), as to California plants, the name based on *Audibertiella argentea* Rydb., Bull. Torr. Club 36:683 (1909), type loc. Mokiak Pass, Ariz., *Palmer* 395. *S. carnosa* subsp. *gilmanii* Epling, l.c. 132, type loc. Piñon Mesa, Wild Rose Cañon, Panamint Mts., *Epling & Gilman*.

13. **S. pachyphylla** Epling. Woody at base, 1 to 2 or 3 feet high; herbage microscopically puberulent or subglabrous, the leaves of the season green, the old leaves gray-scurfy; leaf-blades obovate, or oblanceolate to oblong, obtuse, thickish, not rugose, ½ to 1¼ inches long, narrowed at base to a mostly short petiole; branches bearing 2 to 4 distinct flower-whorls, or the whorls approximate and capitate or spicate, 1 to 1⅝ inches broad; bracts elliptic, membranous, purple, 6 to 9 lines long; corolla blue, 9 to 12 lines long, its lips relatively short, the middle lobe of lower lip erosulate or laciniate, the tube with a dense ring of hairs on its lower part, the ring sharply defined below, thinning out above into a broad zone of scattered hairs.

Gravelly slopes under pines, junipers or among piñons, 5000 to 8800 feet: San Bernardino, San Jacinto and Santa Rosa mountains. Northern Lower California. July-Aug.

Geog. note.—Salvia pachyphylla occupies a natural phytogeographic area in the Peninsular Range of Lower California and the northerly extension of that range in the high mountains of Southern California. Its foliage recalls that of the large-leaved form of Salvia carnosa in Idaho and Washington, but the bush here described under Epling's name of S. pachyphylla is different in aspect from the smaller-leaved form of Salvia carnosa which inhabits the Mohave Desert. Salvia pachyphylla is closely related to Salvia carnosa; regarded as a distinct unit it is lacking in technical characters. Many competent botanists have evaluated it as a variety of Salvia carnosa. The two are, however, mutually exclusive in their territory. Salvia carnosa (referring to its variety pilosa) is wholly transmontane in Southern California and widely distributed over the desert mesas and desert mountains. Salvia pachyphylla is intramontane. While restricted to the high sierran range of Southern California, it is, nevertheless, to an approximate degree, transmontane, that is, it inhabits the desert slopes or is found mainly on high summits under the desert influences. The following stations are cited. San Bernardino Mts.: Holcomb Valley (Erythea 6:91); Cactus Flats, *J. Grinnell* 63; Mt. Sugarloaf, *Munz* 10,779; Seven Oaks, *R. J. Smith* 11. San Jacinto Mts.: Hidden Lake, *C. V. Meyer* 568. Santa Rosa Mts.: near Vandeventer Flat, *Duran* 3490.

Refs.—SALVIA PACHYPHYLLA Epling; Munz, Man. 445 (1935). *Audibertia incana* var. *pachystachya* Gray, Syn. Fl. ed. 2, 2:461 (1886), type loc. Bear Valley, San Bernardino Mts., *Parish*. *A. pachystachya* Parish, Erythea 6:91 (1898). *Ramona pachystachya* Hel. Muhl. 1:4 (1900); not S. pachystachya Trautv. (1868). *S. carnosa* var. *campacta* Hall, Univ. Cal. Publ. Bot. 1:111 (1902); Jepson, Man. 870 (1925). *S. compacta* Munz, Bull. S. Cal. Acad. 26:22 (1927); not S. compacta Ktze. (1891).

14. **S. mohavensis** Greene. MOHAVE SALVIA. Low shrub (1 to 2 feet high); herbage puberulent; leaf-blades oblong to ovate, acute or obtuse, rugose above, deeply reticulate-venulose below, crenulate, 3 to 8 lines long, the petioles ¼ to ½ as long and slender; flowers usually in solitary terminal heads; bracts ovate to elliptic, mucronate, glandular, membranous or whitish, reticulate-venulose, 6 to 11 lines long; corolla blue, its lips of about equal length; upper lip shortly cleft, the lower with its 3 lobes about equal, all entire or merely erosulate.

Rocky slopes of desert ranges, often among piñons, 2000 to 4000 (or 7000) feet: Mohave Desert; mountains on north side of the Colorado Desert. East to Nevada and Arizona. May-July.

Locs.—Mohave Desert: Black Hawk Mine, near Victorville, *Jones;* Aztec Spr., Ord Mts. (nw. base), *Feudge* 1605; Twenty-nine Palms, *B. D. Stark* 1534; Camp Cady (mts. near), Daggett region, *S. B. & W. F. Parish* 1308; Cima (5 mi. s.), *B. D. Stark* 2250; Fountain Cañon, Providence Mts., *Mary Beal* 361; Piute Creek, ne. of Goffs, *Wilson* 72; Turtle Mts. (Bull. Torr. Club 49:37). Colorado Desert (n. side): Quail Sprs., Conchilla Mts., *Munz* 5235; Eagle Mts., *Clary* 652.

Refs.—SALVIA MOHAVENSIS Greene, Pitt. 2:235 (1892); Jepson, Man. 870 (1925). *Audibertia capitata* Gray, Proc. Am. Acad. 7:387 (1868), type loc. summit of Providence Mts., *Cooper;* not S. capitata Schlecht. (1853). *Audibertiella capitata* Briq., Bull. Herb. Boiss. 2:73 (1894). *Ramona capitata* Briq., l.c. 440 (1894).

15. **S. eremostachya** Jepson. Shrub 2 to 2½ feet high, the old stems with whitish bark; herbage hirsute or hirsutulose with spreading hairs; leaves rather evidently dimorphic, those of the flowering branches with leaf-blades lanceolate,

obtuse, truncate or obtuse at base, crenulate, plane or eventually revolute, $\frac{3}{4}$ to $1\frac{3}{4}$ inches long, the upper surface scaberulous-rugulose, the lower surface markedly reticulate with hispidulose veins and sprinkled with glandular dots; petioles wing-margined, short ($\frac{1}{2}$ to 3 lines) or none; leaves of the short sterile lateral spurs fascicled, the blades linear, strongly revolute, $\frac{1}{2}$ to $\frac{3}{4}$ inch long; branchlets with 1 to 4 flower-whorls; bracts ovate to lanceolate, cuspidate, ciliate, rather membranous; calyx 2-lipped, the upper lip bearing at apex 3 short spine-tipped teeth, the lower lip shorter, deeply cleft, the 2 teeth acuminate-spinose; corolla purplish, 8 to 9 lines long, the tube extensively hairy within; upper lip short, rounded, cleft, the lower lip much longer, its middle lobe transversely elliptic, broadly notched, erosulate or sparingly incised, the lateral lobes small; stamens well-exserted, 7 to 9 lines long, the filaments with a tooth at the joint.

Rocky cañons or mesas, 1000 to 4500 feet: mountains on west side of the Colorado Desert (San Jacinto Mts. to Mt. San Ysidro). Apr.-May; Nov.

Locs.—Palm Cañon of San Jacinto, *Jepson* 1397; Martinez Cañon, Santa Rosa Mts., *Childs;* Piñon Flat, Santa Rosa Mts., *Gilman* 710; Rockhouse Cañon, n. of Collins Valley (Bull. S. Cal. Acad. 26:23); Indian Cañon, s. side of Collins Valley (n. side Mt. San Ysidro).

Ref.—SALVIA EREMOSTACHYA Jepson, Man. 870 (1925), type loc. Indian Cañon, s. of Collins Valley, ne. San Diego Co., *Jepson* 8847.

10. **MELISSA** L.

Lemon-scented perennial herbs with broad leaves and white flowers in loose axillary clusters. Calyx narrowly campanulate, 13-nerved, deflexed in fruit, the upper lip spreading, almost truncate, its 3 teeth short and broad, the lower lip longer, erect, 2-parted into lanceolate-acuminate lobes. Corolla exserted, nearly twice as long as the calyx, 2-lipped; upper lip erect, notched; lower lip spreading, 3-cleft. Stamens 4, converging under the upper lip.—Species 4, Europe and Asia. (Greek melissa, a bee, the bees visiting the flowers for honey.)

1. **M. officinalis** L. GARDEN BALM. Stems slender, 1 to 4 feet high; stems and petioles short-villous or glabrous; leaf-blades ovate, crenate, truncate at base, hirsutulose, or often glabrous beneath, 1 to $2\frac{1}{2}$ inches long, the petiole $\frac{1}{3}$ to $\frac{1}{2}$ as long; corolla yellowish or whitish, 5 lines long, its tube with an obscure oblique ring of long hairs.

Native of Europe, escaped from gardens into shady woods or along stream banks, 100 to 1800 feet: Coast Ranges. July-Aug.

Locs.—Trinity River Valley near the South Fork, *Tracy* 7232; South Fork Eel River, Humboldt Co., *Jepson* 16,472 in 1932 (Dyerville), 17,854 in 1936 (Phillipsville); Guerneville, Sonoma Co., *Davy* 4146 in 1896; Napa River near St. Helena, *Jepson* 16,904 in 1934; Palo Alto Creek, Marin Co., *Congdon* in 1897; Stonybrook Cañon, Niles, *Carter* 939 in 1935; betw. Boulder Creek and Big Basin, Santa Cruz Mts., *V. F. Hesse* 144 in 1940.

Refs.—MELISSA OFFICINALIS L., Sp. Pl. 592 (1753), type from south central Europe; Jepson, Fl. W. Mid. Cal. 462 (1901), ed. 2, 361 (1911), Man. 872 (1925).

11. **ACANTHOMINTHA** Gray

Annuals with dentate leaves and flowers in distinct or at length remote whorls, each whorl subtended by a pair of leaves and a circle of broad callous-margined chartaceous bracts armed with needle-like spines. Calyx 2-lipped; upper lip 3-toothed, the teeth aristate; lower lip short, 2-cleft into oblong acute lobes. Corolla white, or sometimes partially rose-color, 2-lipped, exceeding the calyx; upper lip entire or retuse, a little hooded; lower lip 3-lobed. Stamens 4, inserted high in the ample throat; lower pair fertile; upper pair with smaller or imperfect anthers. Nutlets smooth. (Greek acantha, thorn, and mentha, mint.)

Style hairy; corolla-tube gradually enlarged upward into ampliate throat; anthers glabrous; nutlets about 1 line long; bracts and upper part of stems villous-glandular....1. *A. lanceolata.*

Style glabrous; nutlets hardly ¾ line long; bracts and upper stems merely puberulent, non-glandular.
  Anthers glabrous or slightly hairy; corolla-tube gradually enlarging upward to the slender throat........2. *A. ilicifolia.*
  Anthers woolly; corolla-tube abruptly expanding to an open somewhat gibbous throat........3. *A. obovata.*

1. **A. lanceolata** Curran. (Fig. 431.) Stem stoutish, branching from the base, 7 to 12 inches high; herbage soft-pubescent, oily and ill-scented; leaf-blades ovate to oblanceolate, entire to sparingly dentate, 3 to 11 lines long, the petiole slender; bracts elliptic-ovate, 5 to 6 lines long, the aristate prickles 3 to 4 lines long; corolla white, 6 to 7 lines long, rather deeply 2-lipped, its tube 1 to 1½ lines long, gradually ampliate into the throat; throat rather broad above, bearing at base a zone of deflexed hairs; upper lip keeled and somewhat falcate-incurved, cleft at apex; lower lip shallowly saccate, 3-lobed, the middle lobe oblong, the lateral ovate-acute.

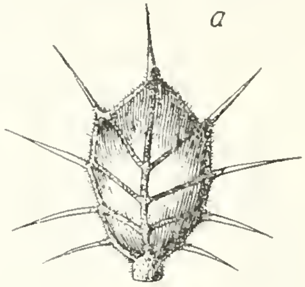

Fig. 431. Acanthomintha lanceolata Curran; bract, × 2.

Rocky places on ridges and cañon slopes, always on serpentine, 1000 to 3600 feet: Mt. Hamilton Range; San Carlos Range (its bordering foothills on west and southwest sides in San Benito Co. and southeastern Monterey Co.). Mar.-July.

Tax. note.—The lower lip of the calyx in Acanthomintha lanceolata is cleft as far down as the lateral sinuses. In the other two species, A. ilicifolia and A. obovata, the lower lip is cleft but not so far down as in A. lanceolata. It is to be noted, also, that spines of the bracts and calyces are longer in A. lanceolata than in A. ilicifolia or A. obovata.

Locs.—Mt. Hamilton Range (nutlets ⅞ line long): Cedar Mt., Alameda Co., *Elmer* 4442; Mt. Hamilton, *Greene;* Soda Springs Cañon, near Madrone Sprs., *Dudley* 4151; upper Puerto Cañon, w. Stanislaus Co., *Hoover* 2628. San Benito and Monterey Cos. (nutlets 1⅛ lines long): Lewis Creek (e. of Loneoak), *Keck* 2852; Slack Cañon, *K. Brandegee;* Parkfield (n. of), *Munz* 9190. The plants from the two regions, Mt. Hamilton Range and San Carlos Range, seem identical save for the slight difference in size of nutlets (R. F. Hoover).

Refs.—Acanthomintha lanceolata Curran, Bull. Cal. Acad. 1:13 (1884), type loc. Calaveras Valley, Alameda Co., *E. Brooks;* T. Bdg., Zoe 4:156 (1893); Jepson, Fl. W. Mid. Cal. 461 (1901), ed. 2, 360 (1911), Man. 872, fig. 818 (1925).

2. **A. ilicifolia** Gray. Stem simple or widely branching from near the base, 4 to 13 inches high; herbage minutely puberulent or subglabrous; leaf-blades roundish-ovate, crenate-cuspidate, obtuse, broadly cuneate at base, 3 to 9 lines long, on petioles about ½ as long; bracts orbicular, with strong callous nerves and margins, 7 to 10-spinose, 4 to 5 lines long; calyx about ½ as long as corolla-tube; corolla white and rose-color, 6 to 8 lines long, the tube and throat glabrous within, the middle lobe of lower lip notched; lower pair of stamens twice as long as the upper.

Hillslopes and mesas, on serpentine rocks, 100 to 1500 feet: eastern foothills of Santa Cruz Mts. in San Mateo Co.; southwestern San Diego Co. Northern Lower California. Apr.-May.

Geog. note.—The distribution of Acanthomintha ilicifolia is discontinuous and peculiar. The San Mateo County plants sometimes have sparsely hairy anthers, but otherwise seem indistinguishable from the plants of San Diego, in which the anthers are apparently always glabrous (R. F. Hoover).

Locs.—San Mateo Co.: Crystal Springs Lake, *Elmer* 4538; Menlo, *Dutton;* Redwood City, *Rose* 33,171. San Diego Co.: San Diego, *Greene;* Paradise Valley, *Cleveland.*

Refs.—Acanthomintha ilicifolia Gray, Syn. Fl. 2:365 (1878); Jepson, Man. 872 (1925). *Calamintha ilicifolia* Gray, Proc. Am. Acad. 8:368 (1872), type loc. "probably Lower California," *Rich.*

3. **A. obovata** Jepson. (Fig. 432.) Stems branching from the base, minutely canescent, 4 to 9 inches high; leaf-blades obovate, denticulate, or the upper spinose-

serrate, puberulent or subglabrous above, 6 to 9 lines long, on petioles 3 to 6 lines long; bracts as in A. lanceolata; corolla white, 6 lines long, shallowly 2-lipped as compared with A. lanceolata; lower lip with a curved band of hairs on the palate; corolla-tube slender, 1 line long, expanded into the upwardly dilated throat which is glabrous within or with a sparsely pubescent zone on the lower part; stamen pairs nearly equal; anthers woolly; style glabrous.

Dry clay soil of hill slopes, 1000 to 5000 feet: inner South Coast Range from San Benito Co. to Mt. Piños. May-July.

Ecol. note.—Acanthomintha obovata exhibits a disposition to occur in colonies about 5 to 30 yards in diameter. It seems to be limited to the friable adobe of flats, ridges and divides. A characteristic station is that in the pass at the head of Los Gatos Creek, inner South Coast Range, southwestern Fresno County. By early summer the light-colored adobe has checked, as a result of desiccation, into irregular blocks forming quadrilateral or octagonal patterns. The checks or cracks in the soil, 1 to 1¼ inches wide, are 1 to 1½ feet deep or more. These dry but friable adobe blocks furnish an optimum substratum for Acanthomintha obovata colonies which come into full flower about June 1. The openly wooded country which they inhabit supports Quercus douglasii and Pinus sabiniana and a little Aesculus californica.

Locs.—Bettys ranch, Lorenzo Creek, San Benito Co., *Jepson* 12,219; Los Gatos Creek (divide at head of), w. Fresno Co., *Jepson* 12,185; Cholame Creek (upper end), se. Monterey Co., *Jepson* 15,911; Lockwood Valley, n. Ventura Co., *Bacigalupi* 2353.

Ref.—ACANTHOMINTHA OBOVATA Jepson, Man. 873, fig. 819 (1925), type loc. Lorenzo Creek, San Benito Co., *Julia A. Bettys.* (typ. in Herbario Jepsoniano).

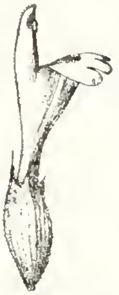

Fig. 432. ACANTHOMINTHA OBOVATA Jepson; fl., × 2½.

12. **POGOGYNE** Benth.

Low sweet-aromatic annuals with obovate or oblanceolate leaves narrowed to a petiole. Whorls crowded in dense spikes or the lower whorls distinct. Bracts and calyx usually hirsute. Calyx unequally 5-cleft, the two lower teeth longer; tube mostly 15-nerved; throat naked. Corolla straight, tubular-funnelform, purple or bluish; upper lip erect, entire; lower spreading, with 3 similar oval lobes. Stamens 4, all with anthers, or the upper shorter pair sterile. Style somewhat exserted, in some (perhaps all) species flattened above and always bearded. Nutlets smooth, hairy at apex.—Species 6, western North America. (Greek pogon, beard, and gune, female, on account of the hairy style.)

All four stamens with perfect anthers; style conspicuously bearded above, its lobes almost equal; corollas 4 to 9 lines long, plainly exserted from the bracteate heads.
  Whorls of flowers in dense spikes, the spikes oblong or cylindric, 9 to 12 lines broad, with few if any lower separate whorls; stems typically stoutish............................1. *P. douglasii.*
  Whorls of flowers remote or the uppermost in a terminal spike; stems typically slender.
    Calyx-lobes glabrous on the back and margin, hairy inside; bracts inconspicuously hairy or subglabrous; whorls or spikes 6 to 9 (or 12) lines broad........2. *P. nudiuscula.*
    Calyx-lobes hirsute-ciliate and hairy on back; bracts densely white-ciliate toward base; whorls or spikes 2 to 4 (or 5) lines broad..3. *P. abramsii.*
Upper stamens sterile; style sparingly hairy, its lobes very unequal; corollas smaller (1 to 4 lines long), hidden in bracteate heads.
  Stems a little stout; whorls or spikes 6 to 9 (or 5 to 12) lines broad; bracts conspicuously ciliate with white bristly hairs; nutlets ¾ to 1 line long..................4. *P. zizyphoroides.*
  Stems slender; whorls or spikes 4 to 6 lines broad; bracts sparsely ciliate with soft hairs; nutlets hardly ½ line long..5. *P. serpylloides.*

1. **P. douglasii** Benth. (Fig. 433.) Stem freely branched from the base or sometimes simple, 4 to 10 inches high, rarely 2 feet high; leaf-blades oblanceolate or obovate, ¾ to 1¼ inches long, narrowed to a petiole; whorls forming a dense terminal spike, often with a single accessory whorl in the adjacent axil below, or sometimes several of the lower axils with flowers; bracts cuspidate, the margin conspicuously ciliate with white hairs; lower divisions of calyx longer than tube; corolla purple or bluish, the palate white, dotted with purple, pubescent, 5 to 9 lines long; stigmas subequal; nutlets smooth, often mottled, minutely hispid at the apex.

Low fields, hog wallows of plains, and shallow valley basins, dry in summer but flooded in the rainy season, 10 to 2000 feet: Coast Range valleys from central Mendocino Co. to San Luis Obispo Co.; Great Valley (but not on west side of the San Joaquin Valley); Sierra Nevada foothills from Mariposa Co. to Kern Co. May-June.

Ecol. note.—Pogogyne douglasii is, in May and June, a characteristic inhabitant of the moist beds of former winter pools. The plants are variable as to stature, luxuriance or dwarfing, in more or less direct response to the progress of aridity or to the amount of water stored from the winter rains or to the prevalence of early summer showers. The condition of moist lowland habitats for this species may be such as to favor a continued and somewhat luxuriant flowering in late summer or fall, resulting in long dense spikes (Napa Valley, *Brewer* 855 in November; Lake Co., *Bolander* 2667 in September) which have a peculiar aspect due to leaf loss by high dry-season insolation, fall weathering and concentration of the last flowers at the summit. Even longer spikes (almost twice as long) are, however, displayed by plants from Santa Margarita (*R. W. Summers* in June). Contrariwise, in adobe depressions where "the soil is thin and dries out rapidly," are found low slender plants with a single small terminal head-like cluster of flowers (Pine Creek, near Vina, Tehama Co., *Heller* 11,334). These various forms, which are here regarded as ecological responses, do not exhibit any essential difference in floral characters. Consequently such forms would not seem to offer a substantial basis for any rank of taxonomic unit. This judgment is confirmed by R. F. Hoover who writes (ms. note): "Neither Pogogyne parviflora Benth. nor the subspecies named by J. T. Howell (Proc. Cal. Acad. ser. 4, 20:105–128) are convincing to one who has any considerable field acquaintance with these plants. The characters used for differentiation between these forms depend to a small extent on the manner in which the specimens have been preserved but largely on conditions of habitat and degree of maturity." The corolla is rarely white.

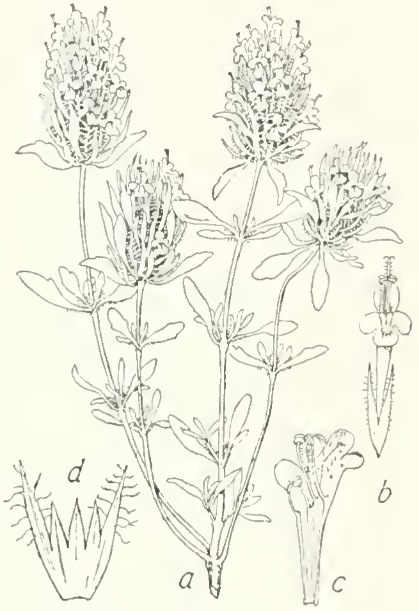

Fig. 433. Pogogyne douglasii Benth. *a*, habit, × ½; *b*, fl., × 1½; *c*, corolla spread out, × 1½; *d*, calyx spread out, × 2.

Locs.—Coast Ranges: Willits, Little Lake Valley, *Tracy* 14,050; Ukiah, *Purdy;* Bear Valley near Leesville, sw. Colusa Co., *Jepson* 8966; Big Valley, Clear Lake, *Jepson* 14,909; Windsor, Sonoma Co., *Jepson* 9302b; Calistoga, *Jepson* 7662; St. Helena, *Jepson* 14,902; Pope Valley, Napa Co., *Jepson* 14,907; Livermore, *Jepson;* Cerro Alto Mt., San Luis Obispo Co., *Condit & Waters.* Great Valley: Vina (8 mi. s.), Tehama Co., *Heller* 11,334; Cana, Butte Co., *Jepson* 16,367; Oroville (10 mi. sw.), *Hoover* 1155; Sutter City, *Ewan* 9628; Willows, Glenn Co., *Jepson* 14,904; Wolfskill sta., nw. Solano Co., *Jepson* 10,402; Little Oak, Vacaville, *Jepson* 14,903; Main Prairie, e. Solano Co., *Jepson* 14,906; Farmington, San Joaquin Co., *Tracy* 5793; Merced (10 mi. w.), *Hoover* 1123; Orange Cove, Tulare Co., *Hoover* 1275. Sierra Nevada foothills: Sebastopol, Mariposa Co., *Congdon;* Snow Creek, Chowchilla River, *Congdon;* Fresno Flats, Madera Co.; Raymond (6 mi. s.), Madera Co., *Jepson* 12,913; Poso Creek Valley, Kern Co. (Proc. Cal. Acad. ser. 4, 20:117).

Refs.—Pogogyne douglasii Benth., Lab. Gen. et Sp. 414 (1834), type from Cal., *Douglas;* Hook. f., Bot. Mag. t. 5886 (1871); Jepson, Fl. W. Mid. Cal. 461 (1901), ed. 2, 361 (1911), Man. 873 (1925). *P. douglasii* subsp. *typica* J. T. Howell, Proc. Cal. Acad. ser. 4, 20:114 (1931). *P. multiflora* Benth., l.c., type from Cal., *Douglas. P. douglasii* var. *multiflora* Briq.; Engler & Prantl, Nat. Pflzfam. 4^{3a}:304 (1896). *P. parviflora* Benth., l.c., type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 462 (1901), ed. 2, 361 (1911), Man. 874 (1925). *P. douglasii* subsp. *parviflora* J. T. Howell, Proc. Cal. Acad., ser. 4, 20:117 (1931). *P. douglasii* subsp. *ramosa* J. T. Howell, l.c. 116 (1931), type loc. Merced, *J. T. Howell* 2004. *P. douglasii* subsp. *minor* J. T. Howell, l.c. 116 (1931), type loc. Merced, *J. T. Howell* 4211.

2. **P. nudiuscula** Gray. Stems branching mostly near the base, slender, erect, 6 to 12 inches high, puberulent; leaf-blades spatulate, obtuse, glabrous, 4 to 9 lines long, the petioles 1 to 7 lines long; flower whorls quite distinct or remote, or the terminal ones spicately congested; bracts linear or linear-lanceolate, cuspidate, in-

conspicuously hirsute-ciliate or subglabrous; calyx-lobes narrowly lanceolate, cuspidate, hairy on the inner side but not ciliate and not hairy on the back; corolla ½ inch long, about twice as long as the calyx; anthers of the upper stamens smaller than the others, but polleniferous; nutlets ¾ line long.

Moist swales of valley floors and mesas, 10 to 300 feet: southwestern San Diego Co. May-June.

Locs.—Mission Valley, *T. Brandegee;* mesas e. of San Diego, *Chandler* 5345.

Refs.—Pogogyne nudiuscula Gray, Bot. Cal. 1:597 (1876), type loc. San Diego, *Cleveland;* Jepson, Man. 874 (1925).

3. **P. abramsii** J. T. Howell. Stems diffusely or erectly branching, puberulent, 2 to 5 (or 8) inches high, more slender than in P. nudiuscula; leaf-blades oblanceolate to oblong-obovate, rather obtuse, glabrous, 4 to 9 lines long, often inconspicuous at maturity; flower whorls discrete, or the terminal often spicate-congested; calyx-segments subulate, densely hirsute-ciliate and also hairy on the back; corolla rose-purple, 4 to 6 lines long, the tube white, the central yellow spot of the middle lobe of lower lip dotted with purple; nutlets ½ line long.

Sandy or clay soil of dried rain-pools of mesas, 200 to 450 feet: southwestern San Diego Co. May-June.

Geog. note.—Pogogyne abramsii is found mainly in an area northward of the area occupied by P. nudiuscula; while the two ranges are contiguous they are not coextensive. The former has been collected on the mesa north of San Diego (*Chandler* 5346), 5 miles northeast of San Diego, *C. V. Meyer* 141, and at Linda Vista (*T. Brandegee*).

Ref.—Pogogyne abramsii J. T. Howell, Proc. Cal. Acad. ser. 4, 20:119 (1931), type loc. mesas n. of San Diego, *Abrams* 3446.

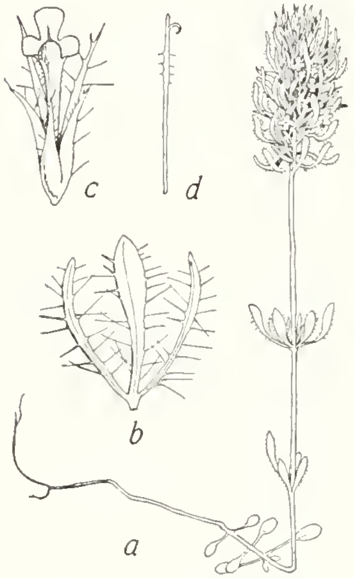

Fig. 434. Pogogyne zizyphoroides Benth. *a*, habit, × ¾; *b*, bract, × 7½; *c*, fl., × 3; *d*, pistil, × 5.

4. **P. zizyphoroides** Benth. (Fig. 434.) Stems short, one or few from the base, 2 to 9 inches high, of stoutish habit; leaf-blades obovate; bracts ciliate with white bristly hairs, the outer bracts oblanceolate, acute or obtuse, the inner linear-spatulate, acuminate; whorls below distinct, with long internodes, above forming a short spike or sometimes capitate; calyx-lobes subulate, very bristly-ciliate, shorter than or slightly exceeding corolla; corolla purple, puberulent, 3 to 4 lines long, the center of lower lip with white and dark-purple markings; 2 lower stamens with large anthers, the 2 upper with very small anthers or none and with shorter filaments or wholly obsolete; nutlets oblong, hispidulose at summit, ¾ to 1 line long.

Heavy clay soil in low places, usually flooded during the rainy season, 20 to 1000 feet: Santa Clara and Alameda Cos.; Great Valley from Madera Co. to Shasta Co.; Sierra Nevada foothills from Mariposa Co. to Shasta Co. North to Jackson Co., Oregon. Apr.-June.

Locs.—Santa Clara Co.: Coyote sta. (Proc. Cal. Acad. ser. 4, 20:127). Alameda Co.: Niles (Proc. Cal. Acad. l.c.). Great Valley: Daulton, Madera Co., *Hoover* 3453; Merced (Proc. Cal. Acad. l.c.); Oakdale (7 mi. se.), *Jepson* 18,103; Antioch, *Chesnut & Drew;* Cannon sta., Solano Co., *Jepson* 6779; Rio Linda, Sacramento Co., *Jepson* 16,583; Roseville, Placer Co., *R. E. Arp;* Chico, *R. M. Austin;* Willows, Glenn Co., *Jepson* 14,914; Coyote Creek bridge, s. of Red Bluff, *Hoover* 2291; Red Bluff (rubble field ne.), *Jepson* 16,357; Anderson, Shasta Co., *Alice King.* Sierra Nevada foothills: White Rock, Mariposa Co., *Congdon;* Burson, Calaveras Co., *Jepson* 9925; Oroville (8 mi. n.), *Heller* 11,275; Redding (4 mi. e.), *Hoover* 2275.

Refs.—POGOGYNE ZIZYPHOROIDES Benth., Pl. Hartw. 330 (1849), type loc. "Sacramento Valley," *Hartweg* 293 (east side upper Sacramento Valley; cf. Erythea 5:55); Jepson, Fl. W. Mid. Cal. 462 (1901), ed. 2, 361 (1911), Man. 874 (1925). *Hedeomoides zizyphoroides* Briq.; Engler & Prantl, Nat. Pflzfam. 4^{3a}:295 (1896).

5. **P. serpylloides** Gray. Stems several from the base, very slender, diffuse, 3 to 6 (or 9) inches long, or sometimes solitary and erect; leaf-blades obovate-oval or shortly spatulate, 2 to 4 lines long, petioled; whorls except the terminal ones distinct, the lower with few or even solitary flowers; bracts sparsely hairy; flowers inconspicuous; calyx-lobes lanceolate, all longer than the tube, equaling or exceeding the violet or bluish corolla; corolla 1 to 2 lines long, short-pubescent outside; sterile stamens small, with rudiments of anthers or with none; style a little bearded above; nutlets elliptic or obovoid, ½ line long, often mottled.

Grassy moist places or in shade of brush in the foothills, 500 to 4000 feet: Coast Ranges from Humboldt Co. to San Luis Obispo Co.; region of the Marysville Buttes; Sierra Nevada foothills from Eldorado Co. to Mariposa Co. Also in northern Lower California. Apr.-June.

Tax. note.—The thread-like stems of Pogogyne serpylloides are characteristically much more slender than those of P. zizyphoroides; moreover, the stems of the former are typically very spreading, while those of the latter are usually erect. Nevertheless, these two species occasionally simulate each other closely in habit. Size of nutlets has been advantageously used as a basis for specific distinction by J. T. Howell. There is also a distinction in the character of the bracts. In P. serpylloides the bracts are nearly glabrous or only weakly hairy; in P. zizyphoroides the bracts are conspicuously ciliate and hirsute (Man. Fl. Plants Cal. 874). This distinction, according to R. F. Hoover (ms. note), is as reliable as the nutlet character.

Locs.—Coast Ranges: Butler Valley, Mad River, *Tracy* 5829 (coarser and more hirsute than in plants of the species far southward and therefore doubtfully referred here.—J. P. Tracy); Rowe's sta., Mendocino Co., *Chandler* 1060; Healdsburg (Proc. Cal. Acad. ser. 4, 20:123); Berkeley, *Bioletti;* Livermore, *Jepson;* Morrison Cañon, Niles, *Jepson* 14,913; Stanford, *C. F. Baker* 543; Los Gatos (hills w.), *Heller* 7372; San Juan, San Benito Co., *Guirado* 714; ridge betw. San Benito River and Bitterwater, *Hall* 9911; Arroyo Grande, *Alice King.* Region of Marysville Buttes: Live Oak, Sutter Co., *Ewan* 9535. Sierra Nevada: New York Ravine, Eldorado Co., *K. Brandegee;* Willow Sprs., Amador Co., *Jepson* 15,233; New York Falls, Amador Co., *Hansen* 447; Black Creek, 5 mi. ne. of Copperopolis, Calaveras Co., *Tracy* 5635; Burson, Calaveras Co., *Jepson* 9926; Columbia, Tuolumne Co., *Jepson* 6296; Bullion, Mariposa Co., *Jepson* 10,729.

Refs.—POGOGYNE SERPYLLOIDES Gray, Proc. Am. Acad. 7:386 (1868); Jepson, Fl. W. Mid. Cal. 462 (1901), ed. 2, 361 (1911), Man. 874 (1925). *Hedeoma* (?) *serpylloides* Torr., Pac. R. Rep. 4:123 (1857), type loc. Martinez, Contra Costa Co., *Bigelow. Hedeomoides serpylloides* Briq.; Engler & Prantl, Nat. Pflzfam. 4^{3a}:295 (1896). *P. serpylloides* subsp. *typica* J. T. Howell, Proc. Cal. Acad. ser. 4, 20:122 (1931). *P. serpylloides* subsp. *intermedia* J. T. Howell, l.c. 20:125 (1931), type loc. San Juan, San Benito Co., *Guirado* 714.

13. **HEDEOMA** Pers.

Low aromatic herbs. Leaves small, entire or sparingly toothed. Flowers small, in cymes. Cymes few-flowered, borne in the axils of the reduced upper leaves, their bracts small. Calyx mostly 13-nerved, usually gibbous at base, in ours unequally 5-toothed, the 2 lower teeth longer than the 3 upper ones, the throat bearing a dense sharply defined ring of erect hairs within. Corolla blue or purple, 2-lipped; upper lip erect, entire or 2-lobed; lower lip 3-lobed, spreading. Lower pair of stamens anther-bearing, the upper pair represented by reduced filaments or wanting. Nutlets smooth, the calyx-throat commonly contracted in fruit. (From the Greek hedus, sweet, and osme, odor, some ancient sweet-smelling herb known to the Greeks.)

1. **H. nana** Briq. Stems many from the perennial base, erect, wiry, 3 to 8 inches high; herbage puberulent; leaf-blades ovate, entire, 1½ to 3 lines long, short-petioled; flowers 2 to 5 in the opposite leaf-axils, pedicelled; corolla 3 to 4 lines long; middle lobe of lower corolla lip a little cupped, the lateral lobes low, broad, rounded.

Crevices of rocks and under ledges on mountain slopes and in dry sandy-gravelly stream beds, 3000 to 4500 feet: Providence Mts., eastern Mohave Desert. South to Mexico, east to Texas and Colorado. May.

Locs.—Mitchell Caverns, *Jepson* 18,172; Gilroy Cañon, *Jepson* 18,254; Bonanza King Cañon, *Mary Beal* 618.

Refs.—HEDEOMA NANA Briq.; Engler & Prantl, Nat. Pflzfam. 4^{3a}:294 (1896). *H. dentata* Torr. var. *nana* Torr., Bot. Mex. Bound. 130 (1859), type loc. rocky hills of the Rio Grande in e. N. Mex., near El Paso, Tex. *H. thymoides* Gray, Syn. Fl. 2:362 (1886), not H. thymoides Pers. (1807).

14. SPHACELE Benth.

Shrubs or merely suffrutescent plants. Flowers solitary in the axils of the reduced upper leaves, thus forming a leafy raceme. Calyx campanulate, deeply and nearly equally 5-toothed, about 10 to 15-nerved, reticulate-veiny, conspicuously inflated and membranous after flowering. Corolla large and rather showy, with 4 short spreading lobes, the fifth and lowest lobe much longer and erect; throat long and ample, the proper tube short and somewhat narrower, and with a hairy ring within at summit. Stamens 4, somewhat ascending; filaments naked; anthers somewhat approximate, the cells diverging.—Species 20, North and South America, one in Hawaiian Islands. (Sphakos, the name of the Greeks for sage, the plants of this genus having similar foliage.)

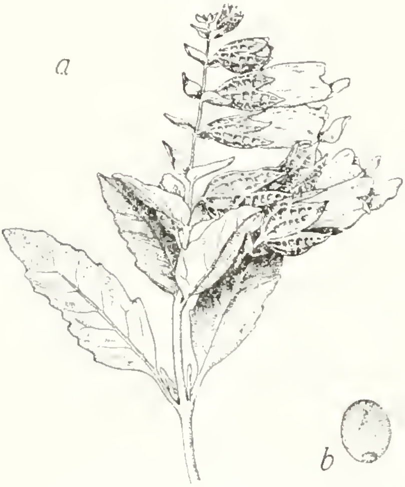

Fig. 435. SPHACELE CALYCINA Benth. *a*, fl. branchlet, × ⅔; *b*, nutlet, × 4.

1. **S. calycina** Benth. PITCHER SAGE. (Fig. 435.) Erect, 1 to 3 (or 5) feet high; herbage pubescent or even somewhat woolly; leaf-blades broadly ovate to oblong-ovate, obtuse, dentate or serrate, very veiny beneath, the base entire and varying from cordate to acute, 2 to 4 inches long, the lower on petioles 2 to 8 lines long, the uppermost sessile; calyx in anthesis rather broad at base, its lobes triangular-lanceolate; corolla white or pink-tinted, ⅞ to 1⅛ inches long; calyx in fruit ovoid-inflated, ¾ to 1⅛ inches long, the tips of the lobes incurving; nutlets black, finely pubescent but smooth, broadly elliptical in outline, nearly 2 lines long.

Open chaparral ridges, hillslopes and cañons, 10 to 3000 feet: Ventura Co.; Santa Barbara Co.; Coast Ranges from San Luis Obispo Co. to Marin and Lake Cos.; Sierra Nevada from Mariposa Co. to Butte Co. May-June.

Geog. note.—Sphacele calycina is found in Ventura Co. and Santa Barbara Co. and throughout the South Coast Ranges from San Luis Obispo Co. to Contra Costa Co. It inhabits the coast line near Monterey, where it grows only a few hundred yards back of the beaches, and extends east into the dry inner South Coast Range, though probably it is not found on the east slope of that range. As in the case of a number of South Coast Range species it recurs in the foothills and ranges surrounding the Sacramento Valley. It has not been reported in the inner North Coast Range north of the Vaca Mountains, but will doubtless be found in that as yet little explored region. The nutlets are nearly spherical, black and shining, and covered with very short spreading straight white hairs. In the field these hairs are scarcely visible on the direct side of the fruit, but appear like a dew on the sides of the subglobose body. The shrubs, after chaparral fires or artificial clearings, sprout from the root-crown.

Pubescence varies. The stems are puberulent, the leaves in varying degrees puberulent or hirsutulose, or sometimes whitish-tomentulose below. Degree of pubescence has no geographic or observable ecologic significance. Bushes with greenish leaves and bushes with leaves tomentulose beneath grow in similar situations, for example, on Mt. Tamalpais. Amount of woolliness is sometimes correlated with age. A state with very thin pubescence is var. glabella Gray. There is no constant correlation of degrees of pubescence with leaf shape in what is here described as Sphacele calycina.

Locs.—Ventura Co.: Matilija Cañon (w. fork), *Hall* 7841. Santa Barbara Co.: San Marcos Pass, Santa Inez Mts., *Jepson* 12,139. Coast Ranges: La Panza, San Luis Obispo Co., *Keck* 2819;

Jolon, Monterey Co., *Jepson* 14,889; Pacific Grove, *Jepson* 9754; Saratoga, Santa Clara Co., *Jepson* 5625; Mt. Diablo, *Jepson* 3121; Mt. Tamalpais, *Newlon* 85; Mt. St. Helena; Weldon Cañon, Vaca Mts., *Jepson* 14,888; Reiff, Knoxville Ridge, *Jepson* 19,004; Lower Lake, Lake Co., *Jepson* 18,906. Sierra Nevada: El Portal, Merced River; Alabaster Cave, Eldorado Co., *Sonne;* Newcastle, Placer Co., *W. W. Mackie;* Nevada City, *W. I. Follett;* Forest ranch, Butte Co., *W. I. Follett* 43.

Var. wallacei Gray. Lower cauline leaves truncate at base; calyx in anthesis narrow-based, villous, its lobes linear- or narrow-lanceolate.—San Gabriel Mts. (Mt. Wilson, *Peirson* 177); Santa Monica Mts. (Los Alisos Cañon, *Epling*); Santa Barbara Isls. (Santa Catalina Isl., *McClatchie;* Santa Rosa Isl., *T. Brandegee*).

Refs.—SPHACELE CALYCINA Benth., Lab. Gen. et Sp. 568 (1834), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 463 (1901), ed. 2, 362 (1911), Man. 876, fig. 823 (1925). *Lepechinia calycina* Epling; Munz, Man. 447 (1935). *S. calycina* var. *glabella* Gray, Bot. Cal. 1:598 (1876), type loc. Santa Barbara Co., *Peckham;* Jepson, Man. 876 (1925). *Lepechinia calycina* var. *glabella* Epling, l.c. *S. gracilis* Eastw., Zoe 5:83 (1900), type loc. hills betw. King City and Jolon, Santa Lucia Mts., *Eastwood.* *S. calycina* var. *gracilis* Jepson, Man. 876 (1925). *S. blochmanae* Eastw., Bull. Torr. Club 30:495 (1903), type loc. Pozo, s. San Luis Obispo Co., *Eastwood.* Var. WALLACEI Gray, Bot. Cal. 1:598 (1876), type loc. near Los Angeles, *Wallace;* Jepson, Man. 876 (1925). *S. fragrans* Greene, Pitt. 1:38 (1887), type loc. Santa Cruz Isl., *Greene.* *S. cordifolia* Gdgr., Bull. Soc. Bot. Fr. 65:68 (1918), type loc. Claremont, *C. F. Baker* 5061 (not Benth.; DC., Prodr. 12:257,—1848). *Lepechinia calycina* var. *wallacei* Epling; Munz, Man. 447 (1935).

15. SATUREIA L.

Perennial herbs or slender-stemmed shrubs. Flowers few or solitary in the axils of the upper leaves. Calyx tubular, 10 to 15-nerved, with 5 acuminate teeth of nearly equal length but sometimes differing in breadth. Corolla 2-lipped, the tube straight. Stamens 4, all anther-bearing, the lower pair longer than the upper. Nutlets smooth.—Species about 130, all continents except Australia. (The ancient Latin name used by Pliny.)

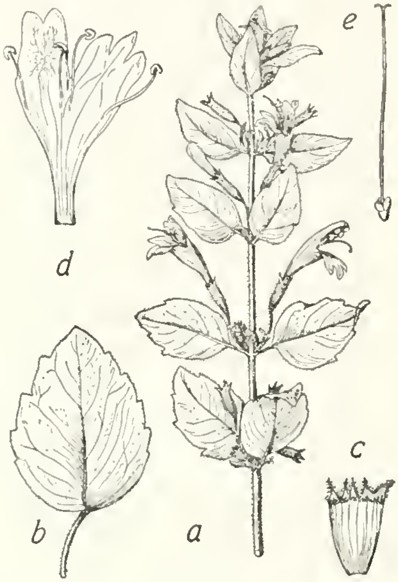

Fig. 436. SATUREIA MIMULOIDES Briq. *a*, flowering branchlet, × ½; *b*, leaf, × ½; *c*, calyx spread open, × 1¼; *d*, corolla spread open, × 1; *e*, pistil, × 1.

Calyx-teeth spinose; corolla large (1⅛ to 1¾ inches long), strongly 2-lipped, orange-red; style glabrous....................1. *S. mimuloides.*

Calyx-teeth not spinose; corolla small (4 to 7 lines long), white.

- Flowers commonly clustered, borne on bractless pedicels less than 1 line long; calyx markedly 2-lipped; style sparsely hairy on one side toward the summit; leaves tomentose beneath....................2. *S. chandleri.*
- Flowers solitary, borne on bracted pedicels 2 to 8 lines long; calyx not 2-lipped, equally 5-lobed; style glabrous; leaves puberulent or glabrous....................3. *S. douglasii.*

1. **S. mimuloides** Briq. (Fig. 436.) Stems slender, villous, 2 to 5 feet high; leaf-blades ovate, serrate, pubescent, 1½ to 3 inches long, the petioles about ⅓ as long; calyx 6 to 8 lines long, its teeth aristate, spreading in age; axillary clusters 1 to 5-flowered, the pedicels ½ to 1½ inches long; 3 upper calyx-teeth broader and united slightly higher than the 2 lower; corolla orange-red or pale crimson, villous without, 1⅛ to 1¾ inches long, very Mimulus-like; upper lip erect, cleft, bearing a cobwebby-villous patch within; lower lip spreading, its middle lobe much longer than the lateral ones; tube within at base very nectariferous; nutlets somewhat flattened, 3-nerved, retained in the calyx in age by the ring of hairs at the mouth.

Rich alluvium of creek banks in cañon bottoms and on mountain slopes, 1000 to 4500 feet: Monterey Co. to Los Angeles Co. July-Oct.

Locs.—Arroyo Seco, Santa Lucia Mts., *Ewan* 8997; Santa Lucia Peak, *Jepson* 4738; Nacimiento River, sw. Monterey Co., *Peirson* 11,828; San Luis Obispo, *Condit* 14; Los Olivos, Santa Barbara Co., *Virginia P. Fox;* Arroyo Seco Cañon, San Gabriel Mts., *Moxley* 437; Bear Cañon, San Gabriel Mts., *Barber* 216.

Refs.—SATUREIA MIMULOIDES Briq.; Engler & Prantl, Nat. Pflzfam. 4^{3a}:302 (1896). *Calamintha mimuloides* Benth., Pl. Hartw. 331 (1849), type loc. Carmel River, *Hartweg* 122. *Clinopodium mimuloides* Ktze., Rev. Gen. Pl. 1:515 (1891); Jepson, Man. 875 (1925).

2. **S. chandleri** Druce. Stems 1 to 3 feet high, ascending, branching, wiry-flexible, forming clumps; herbage pubescent, the leaves tomentulose beneath; leaf-blades round-ovate to deltoid, obtuse, truncatish at base, thickish, weakly crenulate or subentire, hirsutulose above, tomentose beneath, 4 to 7 lines long, the petioles 1 to 4 lines long; calyx tubular-turbinate, 15-nerved, about 4 lines long, hairy without, glabrous within except on the spreading teeth, the 3 upper teeth united slightly higher than the 2 lower; corolla 5 to 7 lines long, strongly 2-lipped, the upper lip cleft, lower lip more deeply 3-cleft and furnished with 2 lines of hairs, all the lobes obtuse.

Rocky cañon bottoms, 1000 to 2500 feet: Riverside and San Diego Cos. Mar.-May.

Locs. — Murietta, Riverside Co., *Robinson & Crocker* 571; San Miguel Mt., San Diego Co.; Jamul Mt., *Gander* in litt.

Refs.—SATUREIA CHANDLERI Druce, Rep. Bot. Exch. Club Brit. Isles 1916:644 (1917); Jepson, Man. 875 (1925). *Calamintha chandleri* Bdg., Zoe 5:195 (1905), type loc. San Miguel Mt., *Chandler* (5277 on herb. label).

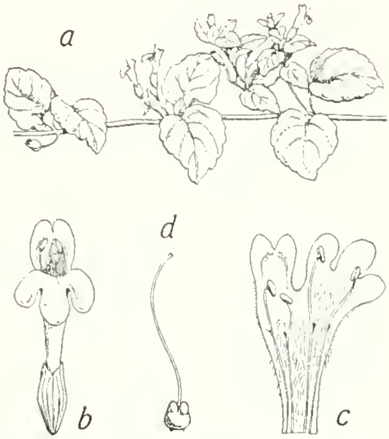

Fig. 437. SATUREIA DOUGLASII Briq. *a*, portion of flowering stem, × ½; *b*, fl., × 3; *c*, corolla spread open; *d*, pistil, × 3.

3. **S. douglasii** Briq. YERBA BUENA. (Fig. 437.) Stems slender, trailing, ½ to 2 feet long; herbage slightly pubescent; leaf-blades round-ovate, crenate, glandular-punctate (especially on the under surface) or glabrous, ½ to 1 inch long, on petioles 1 to 3 lines long; calyx and corolla exteriorly short-hairy; calyx about equally 5-toothed, the short teeth erect; corolla 4 to 5 lines long, the upper lip notched or shortly cleft, the lower lip deeply 3-lobed, all the lobes obtuse.

Shady woods, 10 to 2500 feet, common: along the coast from Los Angeles Co. to Humboldt Co. North to Idaho and British Columbia. May-Aug.

Field note.—In favorable situations the trailing stems take root at the tip and thus reproduce the plant vegetatively; the root-crown also gives rise to stolons which strike roots at intervals. The foliage is evergreen; by December it has become spicy-fragrant. Mountaineers on the trails in the western Siskiyou Mountains steep the leaves for a warming drink at their camps.

Locs.—Coastal region: Santa Catalina Isl. (Erythea 7:145); Santa Monica Mts. (Proc. S. Cal. Acad. 1:23); Coon Creek Cañon, San Luis Obispo Co., *Condit;* Carmel, *Newlon* 129; Midway Point, Monterey, *Jepson;* Watsonville, *Elmer* 4308; San Francisco, *C. F. Baker* 5055; Berkeley Hills, *Jepson* 10,023; Comptche, Mendocino Co., *H. A. Walker* 95; Bull Creek, South Fork Eel River, *Jepson* 16,475; Eureka, *Tracy* 2201; Redwood Creek at Berry ranch, Humboldt Co., *Jepson* 1966.

Refs.—SATUREIA DOUGLASII Briq.; Engler & Prantl, Nat. Pflzfam. 4^{3a}:300 (1896). *Thymus douglasii* Benth., Linnaea, 6:80 (1831), type from Cal., *Chamisso. Micromeria douglasii* Benth., Lab. Gen. et Sp. 372 (1834). *Clinopodium douglasii* Ktze., Rev. Gen. Pl. 1:515 (1891). *Thymus chamissonis* Benth., Linnaea 6:80 (1831), type from Cal., *Chamisso. Micromeria chamissonis* Greene, Man. Reg. S. F. Bay 289 (1894); Jepson, Fl. W. Mid. Cal. 463 (1901), ed. 2, 362 (1911), Man. 875 (1925). In Linnaea 6:80, Bentham published two species, Thymus chamissonis and Thymus douglasii, as new on the same page. Later he found them equivalent and made choice of the latter specific name in transferring the species to Micromeria. Under the present International Rules of Nomenclature, this choice holds as to the species name to be preserved.

16. **STACHYS** L. Hedge Nettle

Ours hispid or soft-pubescent perennial herbs. Flowers few to several, borne in whorls in the axils of the upper reduced leaves or bracts, thus forming a dense or interrupted spike. Calyx tubular-campanulate or turbinate, 5 to 10-nerved or -ribbed, with 5 nearly erect or spreading pointed equal teeth, sometimes the upper teeth larger and more or less united, all usually cuspidate. Corolla with cylindrical tube, little or not at all dilated at the throat; upper lip erect or slightly turned backward, over-arched or concave, entire or notched; lower lip longer, spreading, 3-lobed, the middle lobe larger, the lateral lobes often deflexed. Stamens 4, in pairs, ascending under the upper lip of the corolla, or one or both pairs sometimes deflexed to the sides of the throat and contorted after anthesis. Nutlets obtuse at apex.—Stachys arvensis, an adventive alien, is annual.—Species 200, all continents except Australia. (Greek stachus, an ear of corn, hence a spike; given to these plants on account of their spicate inflorescence.)

Corolla large, showy, crimson, the tube 8 to 15 lines long; stems with stout rigid recurving hairs on the angles; cent. and n. Cal. coast........1. *S. chamissonis.*
Corolla smaller, white to purplish or red, the tube 3 to 7 lines long; stems variously hairy but hairs not stout and rigid (except sometimes in S. bullata).
  Herbage usually closely white-woolly, the stems loose-cobwebby; spikes 3 to 12 inches long, the whorls dense to remote; corolla dull whitish, the ring of hairs in tube very dense, very oblique; widely distributed........2. *S. albens.*
  Herbage hairy, often densely so, but not white-woolly nor stems cobwebby.
    Flower-whorls more or less distinct, forming an interrupted spike.
      Stamens exserted from corolla-tube 1 to 2 lines; nutlets dark brown, at least 1 line long.
        Corolla-tube with oblique ring of hairs about ⅓ of length above the base, usually somewhat saccate on lower side.
          Corolla white or pink, the tube distinctly saccate, 1 to 1½ times as long as the calyx; widely distributed........3. *S. ajugoides.*
          Corolla bright purple, the tube slightly or not at all saccate, about twice as long as the calyx; Redwood belt from Mendocino Co. to Del Norte Co........4. *S. emersonii.*
        Corolla-tube with horizontal ring of hairs within near base, never saccate, the tube twice as long as the calyx; coastal hills from San Francisco to Orange Co........5. *S. bullata.*
      Stamens scarcely exserted from corolla-tube; corolla-tube with a horizontal ring of hairs; nutlets light brown, ¾ line long; inner North Coast Ranges and northern Sierra Nevada........6. *S. stricta.*
    Flower-whorls congested to form a dense cylindrical spike; corolla whitish; cent. Cal. coast........7. *S. pycnantha.*

1. **S. chamissonis** Benth. Swamp Stachys. (Fig. 438.) Stems erect, simple, ending above in 1 to 3 spikes, 3 to 7 (or 10) feet high, the angles of the stems retrorsely scabrous, the hairs pustulate, often viscid; leaf-blades ovate, crenate, 3 to 6 inches long, soft-pubescent, all petioled; spikes 4 to 12 inches long, the flower-whorls mostly discrete; calyx clavate-tubular, 5 to 7 lines long; corolla red, its tube 8 to 15 lines long, much exserted, with a hairy ring within near the base.

Swamps or wet places of stream borders along the coast, associated with Alnus rubra, 10 to 500 feet: San Luis Obispo Co. to Humboldt Co. North to Oregon. June-July.

Field note.—Stachys chamissonis tends to form colonies in low wet spots or in marshes. It is remarkable for its tall slender stems, often 7 to 10 feet high, which are quite unbranched save in the terminal inflorescence. Sometimes, indeed, even the inflorescence is unbranched and the whole epigaeous plant is represented by a single axis. The odor of the herbage is very strong and very disagreeable, clinging for hours to the clothing of the botanical traveler after some minutes' association in a thicket of it. It is only with some difficulty that one establishes the basic mint odor. Flowering is usually very abundant. The hairy ring in the corolla-tube is partially interrupted on the upper side opposite the style. The upper pair of filaments are flattened and hairy on both edges; the lower pair of filaments are also flattened but hairy only on the upper edge.

Locs.—Oak Park, San Luis Obispo Co., *Hall* 7693; Lucia, Monterey coast, *Jepson* 1672; Pacific Grove, *Jepson* 9785; Pilarcitos, San Mateo Co., *Elmer* 4760; Presidio, San Francisco (Bolander, Cat. Pl. Vic. S. F. 22); Sausalito, *Congdon;* Inverness, Marin Co., *Jepson* 9805; betw. Fort Bragg and DeHaven, *Jepson* 14,956; Ferndale, Humboldt Co., *M. S. Baker* 124; Eureka, *Tracy* 16,726.

Refs.—STACHYS CHAMISSONIS Benth., Linnaea 6:80 (1831), type from Cal., *Chamisso;* Jepson, Fl. W. Mid. Cal. 458 (1901), ed. 2, 358 (1911), Man. 877 (1925). *S. flaccida* Eastw., Bull. Torr. Club 29:80 (1902), type loc. Mendocino, *H. E. Brown* 836, apparently an ecological form of deep shade; not S. flaccida Fer. (1900).

2. **S. albens** Gray. WHITE STACHYS. Stems erect, strict, 2 to 5 (or 10) feet high; herbage white-tomentose, or soon subglabrate and green; leaf-blades ovate to lanceolate, crenate, cordate or truncatish at base (at least the lower), 1½ to 4 (or 6) inches long, sessile or subsessile, the very lowest mostly short-petioled; whorls several-flowered; spikes 3 to 6 (or 12) inches long, dense, with 4 to 9 whorls or sometimes 10 to 21 whorls, the lowermost whorls usually distinct, sometimes all the whorls distinct; calyces often somewhat yellow-green, the teeth a little over half as long as the tube, awn-pointed; corolla white, 4 to 5 lines long, the tube 3 to 3½ lines long, little exceeding the calyx, bearing within at the middle a ring of hairs; ring very oblique, the tube not hairy (or scarcely) above or below the ring; nutlets sparsely to densely tuberculate.

Along rivulets, about springs in the dry hills, in valley marshes and mountain meadows, 5 to 8200 feet: inner Coast Range from Lake Co. to eastern San Luis Obispo Co.; Great Valley delta; Sierra Nevada from Plumas Co. to Tulare Co.; Inyo Co.; Tehachapi Mts.; western Mohave Desert; cismontane Southern California. June-Aug.

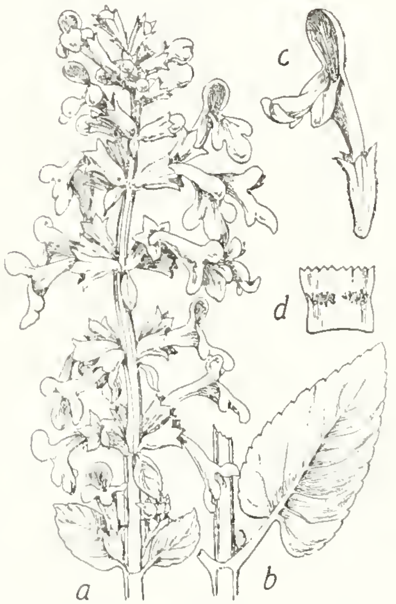

Fig. 438. STACHYS CHAMISSONIS Benth. *a*, fl. stem, × ½; *b*, leaf, × ½; *c*, fl., × 1; *d*, sect. of corolla-tube spread out, showing hairy ring inside, × 1½.

Field note.—The plants of Stachys albens are, when young, extremely white-woolly with an almost glistening whiteness, especially in the form which is found about springs near the heads of open cañons in the Coast Ranges. Very shortly, however, the wool is partially or even at length wholly deciduous and there is then revealed beneath, notably on the leaves, the short-hirsute hairs, often in dense ranks, which have been masked by the outer layer of wool. The use of incomplete material may, on this account, lead to misdeterminations. The altitudinal range of this species is very remarkable. Found near sea-level at 5 feet, as in the Suisun Marshes, it attains 8200 feet in the southern Sierra Nevada (Coyote Pass and Volcano Creek in Tulare County, and on Mt. Piños in northern Ventura County). The plants in the marshes of the Great Valley delta may grow 6 to 10 feet high in the rich peat soil or frequently they have a loose or spreading habit quite different from the trim erectness of these plants in the foothills or at middle altitudes in the Sierra Nevada; their racemes are often extremely long, loose and flexuous, as compared with the short-virgate racemes of the plants of the dry hills.

Locs.—Inner Coast Range: Bear Creek, n. Lake Co., *M. S. Baker* 3065c; Knoxville Ridge, se. Lake Co., *Jepson* 14,976; betw. Samuels Sprs. and Aetna Sprs., e. Napa Co., *Jepson* 14,970; near Mountain House, Altamont Pass, *Jepson* 14,973 (close match for the Xantus type as compared at Gray Herb. in 1896); Pacheco Pass; Estrella, San Luis Obispo Co., *Jared.* Sierra Nevada: Indian Valley, Plumas Co., *Lemmon;* Dogwood Creek, near Rich Pt., Middle Fork Feather River, Plumas Co., *Jepson* 10,621; Hetch-Hetchy, *Jepson* 3467; Yosemite, *Bolander* 6322; Big Mdws., betw. Merced Grove and Yosemite, *Jepson* 14,971; Huntington Lake, Fresno Co., *A. L. Grant* 1121; Florence Lake, South Fork San Joaquin River, *E. Ferguson* 443; Markwood Mdw., Fresno Co., *Jepson* 16,055; Tehipite Valley, *Hall & Chandler* 497; Coyote Pass, Tulare Co., *Jepson* 988; Rocky Gulch, Kaweah, *Walter Fry* 353; Jordan Hot Sprs., se. Tulare Co., *Zeile.* Inyo Co.: Wyman Creek, White Mts., *Duran* 3143; Darwin Falls, Argus Mts., *R. A. Ferris* 7926; Cottonwood Cañon, Death

Valley, *Gilman* 4283a. Tehachapi Mts.: Bisses sta., *Dudley* 372. Western Mohave Desert: Victorville, *Parish* 10,575. Cismontane S. Cal.: Mt. Piños, *J. Grinnell;* Griffins, n. Ventura Co., *Elmer* 3951; Soledad Cañon, n. Los Angeles Co., *Peirson* 1046; Los Alisos Cañon, Santa Monica Mts., *Epling & Dunn;* Echo Park, Los Angeles, *Braunton* 492; San Antonio Cañon, San Gabriel Mts., *C. F. Baker* 3663; Green Valley, San Bernardino Mts., *Braunton* 1029; San Bernardino, *Parish;* Tahquitz Creek, San Jacinto Mts. (Univ. Cal. Publ. Bot. 1:113).

Also cited here are collections from the Great Valley delta, that is, plants representing the form Stachys velutina Greene, later called Stachys ajugoides var. velutina Jepson, their leaf-blades ovate-lanceolate or triangular-lanceolate, leathery, mostly 3 to 4½ inches long, the tomentum short and close, soon greenish; spikes 5 to 10 inches long, the whorls discrete: Hass Slough near Main Prairie, *Jepson* 14,974; Millers Ferry near Walnut Grove, *Jepson* 14,975; Suisun Marshes, *Jepson* 14,972; Roberts Isl., San Joaquin Co., *Sanford* 229; Middle River, San Joaquin Co., *Jepson* 5697; Bouldin Isl. This "velutina" form also occurs in marshes at Alvarado, w. Alameda Co. (*Jepson* 14,962).

Refs.—STACHYS ALBENS Gray, Proc. Am. Acad. 7:387 (1868), type loc. Ft. Tejon, Kern Co., *Xantus* 80; Jepson, Fl. W. Mid. Cal. 457 (1901), ed. 2, 357 (1911), Man. 877 (1925). *S. velutina* Greene, Erythea 2:121 (1894), type loc. Suisun Marshes, *Greene;* not S. velutina Schwein. (1825). *S. ajugoides* var. *velutina* Jepson, Fl. W. Mid. Cal. 457 (1901), ed. 2, 357 (1911), Man. 878 (1925). *S. malacophylla* Greene, Pitt. 3:343 (1898), new name for S. velutina Greene. *S. albens* var. *juliensis* Jepson, Man. 877 (1925), type loc. McKinley Grove, Fresno Co., *A. L. Grant* 1198. *S. lanuginosa* Greene, Pitt. 3:342 (1898), type loc. "mts. of Fresno Co.," *Peekinpah* (undoubtedly near Peckinpah Mill, above North Fork sta., now Madera Co.).

3. **S. ajugoides** Benth. Stems simple, mostly erect, ¾ to 2 feet high; herbage densely villous or silky, whitish, sometimes glabrate; leaf-blades oblong to ovate, obtuse to acute (rarely subcordate) at base, 1 to 2½ (or 4) inches long, petioled, the upper sessile; spikes 1 to 8 (or 13) inches long, the flower-whorls usually discrete, sometimes dense, often with 1 or 2 supplementary whorls below in the axils of the upper foliage leaves; calyx short-campanulate or turbinate, very silky-villous (the teeth often concealed); corolla white or pinkish, 4 to 6 lines long, its lip purple-dotted on center, its tube not exceeding the calyx or only slightly; corolla-tube with a hairy ring below middle, the ring very oblique, the tube slightly constricted below the ring and saccate just above the lower side of the ring.

Low lands, wet valleys and springy cañons, 5 to 500 or 2500 feet, common: Sacramento Valley; lower San Joaquin Valley; Coast Ranges from Del Norte Co. to San Luis Obispo Co.; south to Orange Co. Northern Lower California. May-Sept.

Biol. note.—Usually an inhabitant of rich soil, Stachys ajugoides and its var. quercetorum develop underground rootstocks freely and establish dense colonies. In the late fall or early winter, the terminal portions of rootstocks develop into tubers. The slender rootstock connecting the tuber with the parent system dies away in December. Sometimes isolated portions of the rootstocks are merely thickened. During the high precipitation cycle from about 1870 to 1890, Stachys ajugoides var. quercetorum rapidly extended its area over the floor of Vaca Valley in northwestern Solano County. During the dry cycle from 1918 to 1936 it tended to disappear. The following are citations of localities for Stachys ajugoides:

Locs.—Sacramento Valley: Hamilton, Glenn Co., *Heller* 11,466; Collinsville, Solano Co., *Jepson* 14,965. Lower San Joaquin Valley: Stockton, *Sanford;* Merced (10 mi. w.), *Hoover* 1114. Coast Ranges: Monumental, Del Norte Co., *Parks & Tracy* 11,487; Klamath River at Buck Creek, Del Norte Co., *Van Deventer* 115; Grasshopper Peak, head of Canoe Creek, Humboldt Co., *Jepson* 16,481; Pudding Creek, Fort Bragg, *Jepson* 17,774; St. Helena, *Jepson* 14,967; Napa, *Jepson* 14,960; Berkeley, *Davy;* San Leandro, *Jepson* 14,963; Hunter Point, San Francisco, *Jepson* 12,707; Crystal Springs Lake, San Mateo Co., *Elmer* 4260; Redwood City, *Jepson* 12,938; Pt. Piños, Monterey, *Heller* 6789; San Luis Obispo, *Summers* 680. Coastal S. Cal.: Santa Cruz Isl., *Thacher;* Ojai Valley, *Thacher* 43; San Antonio Cañon, San Gabriel Mts., *Peirson* 179; Sherman, Los Angeles Co., *Braunton* 372; Tustin, Orange Co., *Alice King;* Newport Lagoon, Orange Co., *Booth* 1146.

Of the preceding citations, three only, which are on or near the margins of distribution of Stachys ajugoides, have cordate or subcordate leaf-blades, namely *Jepson* 16,481 in Humboldt County, *Jepson* 17,774 in Mendocino County, and *Peirson* 179 in the San Gabriel Mountains. There are, however, numerous intergrade forms from the species, as described above, to the varietal phases described below. It is impossible, on the basis of field experience and the abundant material now available, to separate Stachys rigida, Stachys quercetorum or Stachys rivularis (as well as a number of other segregates) from Stachys ajugoides as species. Nor can Stachys rigida, Stachys quercetorum or Stachys rivularis be separated from each other on the same basis. These names represent an aggregate species in which there is, in nature, marked but inconstant diversity as to certain organs. This diversity is associated with continuous variability in pubescence (mainly of one kind), continuous variability in leaf shape and size (size being often associated with ecological situation). There is no constant correlation of the variables, pubescence and leafage, but, on the other hand, the entire assemblage is characterized by essentially like habit, by essentially like spikes, by like flowers and by like nutlets and is therefore evaluated as one species by reason of the likeness in constant characters that must be regarded as important. In nature, as to this group, pubescence and leaf shape and size are not only expressed by variables but the variables may be partially developed into certain extremes. An attempt is here made to segregate the pubescence and leaf extremes of this aggregate under varietal names. The citation of stations under such varietal names is, however, often attended with such dilemmas as to compel resort to a decision on geographic grounds rather than on morphological grounds—a concession to the complexity of the web of variables. Such proposed varietal units, as those listed below, are, in consequence, somewhat artificial.

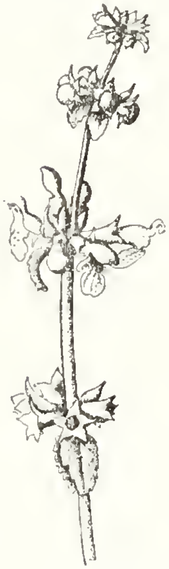

Fig. 439. STACHYS AJUGOIDES Benth. var. QUERCETORUM Jepson. fl. branchlet, × 1.

The following collections represent intergrades from the species to the variety quercetorum: Ross Valley, Marin Co., *Jepson* 14,957; La Jota plateau, Howell Mt., Napa Range, *Jepson* 17,575; Fort Bragg, *Mathews*. There is, therefore, next described:

Var. **quercetorum** (Hel.) Jepson. (Fig. 439.) Herbage green, hirsute or hirsutulose (mostly sparsely so), frequently also puberulent and often glandular, the stem angles hirsute or often retrorsely hirsute or short-hispid; leaf-blades broadly to narrowly ovate (at least the lowermost), 1 to 2 (or 3) inches long, cordate to truncatish at base, more sparsely hairy than in the species, the margins with larger teeth; petioles of the lower leaves mostly ½ to 1½ (or 2) inches long.—Openly wooded dry hills, moist valley flats and cañon bottoms, 10 to 2500 feet: coastal Southern California from San Diego to San Jacinto Valley and Santa Monica; Coast Ranges from Santa Cruz Co. to Humboldt Co. South to northern Lower California. The commonest form in the central Coast Ranges, but largely or wholly absent over large areas from Monterey Co. to Orange Co., where it is replaced by Stachys bullata.

Locs.—S. Cal.: La Jolla, *Jepson* 11,884; Claymine Cañon, Santa Ana Mts., *Howell* 2644; San Jacinto, *Hasse;* San Bernardino, *Parish;* Griffith Park, Los Angeles, *Braunton* 544; Santa Monica, *Hasse*. Coast Ranges: Los Gatos (hills w.), *Heller* 7214; Stanford, *Abrams* 2366; Los Buellis Hills, Mt. Hamilton Range, *R. J. Smith;* Livermore Valley, *Jepson* 14,954; Berkeley, *Jepson* 14,983; Dutton Cañon, Vaca Mts., *Jepson* 14,980; St. Helena (hills e.), *Jepson* 14,982; Kelseyville, Lake Co., *Jepson* 14,978; Fort Bragg, *W. C. Mathews;* Dyerville, mouth of South Fork Eel River, *Jepson* 16,684; Kneeland Prairie, Humboldt Co., *Tracy* 3881.

There are many intergrades from var. quercetorum to the next variety, var. rigida. There are also intergrades from the species to var. rigida (such as Patricks Creek, Del Norte Co., *Parks & Tracy* 11,405).

Var. **rigida** (Nutt.) Jepson & Hoover comb. n. Stems erect, mostly simple, hirsute with spreading hairs, 1 to 3 feet high; leaf-blades ovate or oblong-ovate, serrulate or crenulate, mostly rounded or truncatish at base, acute or acuminate at apex or sometimes obtuse, hirsute or silky, 1 to 3½ inches long; petioles ¼ to 1¼ inches long.—Stream banks and bottoms, moist flats and meadows, 3500 to 6500 feet: mountains of Southern California; northern Sierra Nevada from Mariposa Co. to Modoc and eastern Siskiyou Cos.; Coast Ranges from Humboldt Co. to western Siskiyou Co. North to Oregon. June-July.

Locs.—S. Cal.: Noble Mine, Laguna Mts., *Chandler* 5497; Cuyamaca Mts., *T. Brandegee;* Saunders Mdws., San Jacinto Mts., *C. V. Meyer* 585; Strawberry Valley, San Jacinto Mts., *Jepson* 2270; San Bernardino Mts., *Parish* 1725. Northern Sierra Nevada: Yosemite, *Hall* 9225; Douglas Flat, e. Tuolumne Co., *A. L. Grant* 103; Morgan Sprs., Tehama Co., *Jepson* 12,325; Goose Lake, Modoc Co., *R. M. Austin*. In the foregoing the herbage has, commonly, a somewhat yellowish or brownish cast, the leaf-blades oblong-ovate and mostly obtuse or obtusish. In Lassen and Tehama Cos., the following are less hairy: Martin Sprs., near Eagle Lake, *Brown & Wieslander* 57; Mineral, *J. Grinnell*. In Humboldt, Trinity, Siskiyou and Del Norte Cos., the herbage is usually green, often very thinly hirsute, the leaf-blades commonly acute but sometimes obtuse, the spikes frequently much elongated: Grouse Mt., Humboldt Co., *Tracy* 13,455; Snow Camp Mt., Humboldt Co., *Tracy* 15,652; Trinity Summit, *Tracy* 15,091; Shasta Sprs., Siskiyou Co., *Jepson* 14,958; Woolley Creek, Marble Mt. region, *Butler* 172; Yreka, *Butler* 173; Dunn Creek, ne. Del Norte Co., *Jepson* 18,515.

In the form called Stachys rivularis Hel., the herbage is green, thinly hirsute, scarcely ever silky; the leaves mostly narrowly oblong, sometimes oblong-ovate, serrulate, 1½ to 3½ inches long, shortly petioled below, subsessile or sessile above the base.—It is found on the margins of marshes or along streams, 3000 to 6500 feet, in the northern Sierra Nevada from Tuolumne Co. to eastern Siskiyou Co. and Modoc Co. It is a narrow-leaved or oblong-leaved form of var. rigida in which the same leaf-forms may sometimes occur but are markedly petioled, as generally in the species. The following represent the "rivularis" phase: Hetch-Hetchy, *A. L. Grant* 851; Kennedy Mdw., e. Tuolumne Co., *A. L. Grant* 918; Sawmill place, upper Truckee River, Eldorado Co., *H. M. Wheeler* (leaves rather broad); Bear Valley, Nevada Co., *Jepson* 14,955; Bowman Lakes, Nevada Co., *Carpenter;* Pioneer road sta., 2 mi. e. of Bassett sta., North Fork Yuba River, *Jepson* 16,790; Tamarack road near Burney Valley, Shasta Co., *M. S. Baker* 412; Jess Valley, Warner Mts., *L. S. Smith* 1062; Egg Lake, w. Modoc Co., *M. S. Baker;* betw. Ager and Summit, Siskiyou Co., *Furlong.* The following are also the "rivularis" form save that the petioles are longer: Mineral, e. Tehama Co., *J. Grinnell;* Robbers Roost, Del Norte Co., *Van Deventer* 114; San Diego (12 mi. ne.), *C. V. Meyer* 147.

Var. **cymosa** (Hel.) Jepson comb. n. Spikes dense, short and broad, 1 to 3 inches long, in anthesis nearly 1 inch broad.—Northern Sierra Nevada, 3700 to 5600 feet: Sierra Co. (Pioneer road sta., North Fork Yuba River, *Jepson* 16,804) and Butte Co. (Brush Creek, *Conger*).

Refs.—STACHYS AJUGOIDES Benth., Linnaea 6:80 (1831), type from Cal., *Chamisso* (typ. vidi); Jepson, Fl. W. Mid. Cal. 457 (1901), ed. 2, 357 (1911), Man. 877 (1925). *S. rigida* subsp. *lanata* Epling, Madroño, 4:270 (1938), type loc. Bear Basin, near Gasquet, Del Norte Co., *Epling.* Var. QUERCETORUM Jepson. *S. quercetorum* Hel., Muhl. 2:318 (1907), "Crystal Sprs., San Mateo Co.," *Heller* 8577. *S. rigida* Nutt. subsp. *quercetorum* Epling; Fedde, Repert. Sp. Nov. Beih. 80:59 (1934). *S. rigida* var. *quercetorum* Epling; Munz, Man. 443 (1935). *S. bullata* Jepson, Fl. W. Mid. Cal. 457 (1901), ed. 2, 357 (1911), Man. 878 (1925), not Benth. (1834). *S. ramosa* Hel., Muhl. 1:116 (1905), type loc. Los Gatos, Santa Clara Co., *Heller* 7510. *S. viarum* Hel., Muhl. 2:316 (1907), type loc. San Mateo, *Heller* 8581. *S. gracilenta* Hel., Muhl. 2:319 (1907), type loc. Crystal Sprs., San Mateo Co., *Heller* 8574. Var. RIGIDA Jepson & Hoover. *Stachys rigida* Nutt.; Benth. in DC., Prodr. 12:472 (1848), type from Ore., *Nuttall.* *S. bracteata* Greene, Pitt. 3:342 (1898), type loc. Plumas Co., *R. M. Austin.* *S. vestita* Howell, Fl. Nw. Am. 1:558 (1901), type from sw. Ore., *Howell.* *S. rivularis* Hel., Muhl. 1:33 (1904), type loc. Truckee River, 1 mi. above Truckee, *Heller* 7114. *S. rigida* subsp. *rivularis* Epling; Fedde, Repert. Sp. Nov. Beih. 80:60 (1934). *S. prattenii* Dur., Jour. Acad. Phila. ser. 2, 3:100 (1855), type loc. Nevada City, Nevada Co., *Pratten.* *S. littoralis* Greene, Pitt. 3:341 (1898), type loc. Egg Lake, Modoc Co., *M. S. Baker.* *S. striata* Greene, l.c., type loc. Plumas Co., *R. M. Austin.* *S. ingrata* Greene, l.c., type from the Sierra Nevada, *Harrison.* *S. veronicaefolia* Davy; Jepson, Man. 878 (1925), type loc. Morley's sta., Shasta Co., *Baker & Nutting* (typ. possideo). Var. CYMOSA Jepson. *S. cymosa* Hel. in herb., type loc. Chico Mdws., Butte Co., *Heller* 11,592.

4. **S. emersonii** Piper. Stems erect, 1½ to 3 feet high, hirsutulose (or partially glabrous), also hispidulose on the angles; leaf-blades ovate, crenate, cordate or obtuse at base, thinly hirsutulose, thin, green, 1½ to 4 inches long, the lowest long (1 to 2½ inches)-petioled; spikes 3 to 9 inches long, the flower-whorls 3 to 11, discrete; calyx campanulate, strongly angled, the teeth stellately flaring; corolla rose-purple or deep red, 6 lines long.

Wet ground, ditches and streamlet margins, 10 to 2500 feet: Redwood belt from Mendocino Co. to Del Norte Co. North to Alaska. June-July.

Locs.—Westport, Mendocino Co., *Davy* 6597 (densely hirsute); Bear River, w. Humboldt Co., *Tracy* 15,342; Van Duzen River Valley, Humboldt Co., *Tracy* 2814; Eureka (4 mi. e.), *M. S. Baker* 72; Trinidad, *Tracy* 14,874; Orick, n. Humboldt Co., *Peirson* 7034; Klamath River at Buck Creek, Del Norte Co., *Van Deventer* 116.

Refs.—STACHYS EMERSONII Piper, Erythea 6:31 (Apr. 10, 1898), type loc. Hoquiam, Chehalis Co., Wash., *Lamb* 1138. *S. pubens* Hel., Bull. Torr. Club 25:581 (Nov. 7, 1898). *S. ciliata* var. *pubens* Gray, Syn. Fl. 2:388 (1878). *S. nuttallii* var. *occidentalis* Benth.; DC., Prodr. 12:469 (1848), type loc. "Ad flum. Ore." (that is, lower Columbia River), *Hinds, Barclay.*

5. **S. bullata** Benth. Stems simple, or sometimes branched above, erect or ascending, 10 to 22 inches high, hirsute with spreading hairs, or hispid on the angles (the hairs with pustulate-dilated bases); leaf-blades ovate or triangular-ovate, varying to elliptic, crenate, cordate at base or sometimes truncate, hirsutulose, 1 to 5½ inches long, the lower on petioles ½ to 1½ inches long; spikes 2 to 9 inches long, the whorls 3 to 10, rather remote (½ to 1 inch); calyx turbinate or campanulate-turbinate, the teeth spreading in age; corolla whitish or pinkish, 6 to 8 lines long, its tube nearly cylindric (not saccate), 2 times as long as the calyx, the hairy ring within near the base transverse; lower lip long (3 to 4 lines); filaments densely pubescent at the middle.

Moist shaded cañon bottoms or open slopes, 10 to 2000 feet: along the coast from San Francisco to Orange Co., east through Monterey Co. to San Benito Co. May-June.

Tax. note.—The type of Stachys bullata Benth. was collected on the coast of California, probably at San Francisco, by Beechey's voyage, which visited San Francisco and Monterey from Nov. 6, 1826 to Jan. 5, 1827. The type is in the Herbarium Hookerianum at Kew. A collection of Stachys from San Francisco by M. K. Curran (in 1884) was compared with it in 1897 by J. B. Davy and pronounced a good match. The same material was compared again in 1905 by the present author who likewise judged it an excellent match. The type has only flower buds; its leaves are remarkably bullate-rugose, a feature doubtless consistent with its extreme maturity when collected so late in the dry season. It is this extremely bullate-rugose condition which inspired E. L. Greene's pronouncement of the specimen as wholly unique when he examined it at Kew in 1894. The Curran collection is relatively youthful, but its leaves in some measure recall the Beechey type. As a specimen it is so close that it is here accepted as a working equivalent of the type, and the reference of synonyms and material in this treatment is based upon it. The hairy band in the corolla-tube of the Curran plant is transverse and lies very near the base of the tube as in the coast-line material which was described under the name Stachys californica Benth. in the author's Manual. Although the type of Stachys bullata presents, as said, so unique an aspect, it is, in habit, in size, in the shape and size of its leaves and in its inflorescence, quite reconcilable with the plant known as Stachys californica, which inhabits the coast line or its neighborhood southward from San Francisco.

Locs.—San Francisco, *M. K. Curran;* Lake San Andreas, San Mateo Co., *Davy* 1036; Ben Lomond Mt., *Burton;* betw. Corralitos and Soquel, Santa Cruz Co., *Jepson* 14,968; Monterey, *Jepson* 7444; Carmel River, near Carmel Mission, *Jepson* 14,969; Pacheco Pass, *Jepson* 12,737; South Fork Willow Creek, n. of Bear Valley, San Benito Co., *Jepson* 12,250; Arroyo Grande, *Alice King;* Cañada del Capitan, Santa Barbara coast, *Jepson* 11,909; Sycamore Cañon, Santa Inez Mts., *Jepson* 9146; Pelican Bay, Santa Cruz Isl., *Jepson* 12,122; Monrovia Cañon, San Gabriel Mts., *Peirson* 439; Newport Bay, Orange Co., *Booth* 1080.

Refs.—STACHYS BULLATA Benth., Lab. Gen. et Sp. 547 (1834), type from Cal., *Beechey. S. californica* Benth.; DC., Prodr. 12:469 (1848), type from Cal., *Coulter;* (in the Kew Herbarium there are two Coulter numbers, 533 and 531; the former is here preferred as the type of S. californica, since it answers better Bentham's diagnosis); Jepson, Fl. W. Mid. Cal. 458 (1901), ed. 2, 358 (1911), Man. 877 (1925). *S. acuminata* Greene, Bull. Cal. Acad. 2:410 (1887), type loc. Santa Cruz Isl., *Greene.*

6. **S. stricta** Greene. Stems erect, often stout, 1¼ to 2 feet high, hirsute with spreading hairs, the leaves with somewhat appressed hairs, the entire herbage beneath the pubescence with microscopic resin-glands; leaves very erect or ascending, the blades ovate-lanceolate or oblong, crenate, 2 to 4 (or 6½) inches long, truncate or cordate at base, petioled, the uppermost sessile or auriculate-clasping; spikes dense, or more often interrupted below the apical whorls, 2 to 4 inches long; calyx 2½ to 3 lines long, the teeth deltoid, pungent; corolla-tube without evident constriction, the ring of hairs within horizontal; upper lip of corolla very short (⅓ length of lower lip); nutlets light brown, only ¾ line long.

Edges of marshy ground, 100 to 1500 feet: middle and inner North Coast Ranges from northeastern Sonoma Co. to Mendocino Co. and western Tehama Co.; Sierra Nevada foothills from Mariposa Co. to Butte Co. May-July.

Locs.—North Coast Ranges: Knights Valley, *Davy;* Potter Valley, e. Mendocino Co., *Nettie Purpus;* near Mud Flat, Tehama Co., *Heller* 11,524. Sierra Nevada: Coulterville (2 mi. nw.), Mariposa Co., *Hoover* 3826; Milton, Calaveras Co., *Davy* 1305; Ione, Amador Co., *Braunton* 1087; Oroville (8 mi. n.), *Heller* 11,577.

Refs.—STACHYS STRICTA Greene, Erythea 2:122 (1894), type loc. Knights Valley, *Greene. S. ajugoides* var. *stricta* Jepson, Fl. W. Mid. Cal. 457 (1901), ed. 2, 357 (1911), Man. 877 (1925).

STACHYS ARVENSIS L., Sp. Pl. ed. 2, 814 (1763), type European. Field Stachys. Annual, 1 foot high; stems and petioles thinly pilose, the leaf-blades sparsely hispidulose; leaf-blades deltoid-ovate to elliptic, serrate, subcordate to obtuse at base, ½ to ¾ inch long, the upper shortly petioled; stems with axillary clusters 3 to 6 (or 1 or 2) -flowered; calyx purple, its teeth lanceolate, nearly as long as the tube; corolla pale purple, 3 to 4 lines long, often scarcely longer than the calyx.—Introduced from Europe: fields at Arcata, Humboldt Co., *H. B. Tucker,* in 1935, and at Rowdy Creek, Smith River town, Del Norte Co., *Ruby Van Deventer,* in 1938.

7. **S. pycnantha** Benth. COAST STACHYS. Stem erect, ¾ to 1½ (or 2) feet high; herbage hirsute, mostly green, the surface of the leaves somewhat rugulose and glandular; leaf-blades ovate to oblong-ovate, obtuse or cordate at base, 1 to 4 inches long, mostly petioled; spikes dense, cylindric, nearly bractless, solitary or cymose, 1 to 2 (or 4½) inches long, one or two lowest whorls rarely separate; calyx campanulate, 2½ lines long, very hirsute quite to the tips of the deltoid cuspidate

teeth; corolla white, its tube with an oblique hairy ring within, marked outside by a gibbosity or notch.

Moist flats, springy places in the hills and stream borders, 10 to 1500 feet: outer Coast Range near the coast from Marin Co. to Santa Barbara Co. June-Aug.

Biol. note.—The various collections of Stachys pycnantha agree in possessing a condensed spike-like inflorescence, but usually differ rather markedly in other features. They differ in such a way as to suggest that this species, as commonly received, is not a natural unit but is a form which has arisen independently a number of times from various strains of the widespread and variable Stachys ajugoides and its variety quercetorum or from variety rigida. In such a case the binomial Stachys pycnantha would represent an artificial category—a collection of forms similar in inflorescence but of unlike origin phylogenetically. It is to be added that frequently, in addition, we are confronted with doubtful specimens which bear inflorescences a little too condensed for reference to Stachys ajugoides var. quercetorum, and insufficiently condensed to represent Stachys pycnantha. Specimens of the form, Stachys ajugoides var. cymosa, originally described as Stachys cymosa by Heller, which inhabits the northern Sierra Nevada, have sometimes been referred to Stachys pycnantha. The wide geographic discontinuity of Stachys pycnantha and S. ajugoides var. cymosa, as well as certain structural dissimilarities, suggests in the case of these forms that the latter is not phylogenetically derived from the former but is an independent development.

Locs.—Big Carson, Mt. Tamalpais, *Eastwood;* Tiburon, Marin Co., *Jepson* 14,951; West Berkeley, *Jepson* 14,950; Brooklyn Creek, Oakland, *Kellogg;* Mt. Diablo, *Bowerman* 402; Alpine School, San Mateo Co., *Elmer* 4261; Palo Alto, *Congdon;* Pajaro Hills, n. Monterey Co., *Chandler* (this material is a most excellent match for the Hartweg type in the Herbarium of the Royal Botanic Gardens, Kew, England; it was compared by the writer in 1906; cf. Californian Types at Kew, 293, ms.); Carmel River, *Davy;* Santa Lucia Mts., n. of San Luis Obispo, *Palmer* 365; Bishop ranch, Sisquoc River, Santa Barbara Co., *M. S. Baker.*

Refs.—STACHYS PYCNANTHA Benth., Pl. Hartw. 331 (1849), type loc. mts. near Carmel, *Hartweg* 114; Jepson, Fl. W. Mid. Cal. 456 (1901), ed. 2, 357 (1911), Man. 877 (1925).

17. **PYCNANTHEMUM** Michx.

Glabrous or canescent perennial herbs with white flowers in densely crowded whorls, the whorls disposed in the axils of the uppermost leaves (or the very uppermost leaves reduced). Calyx oblong or tubular, its teeth equal. Corolla-tube little exceeding the calyx; upper lip almost entire, lower 3-cleft. Stamens 4, nearly equal.—Species 15, North America. (Greek pychnos, dense, and anthemon, flower, the inflorescence glomerate.)

1. **P. californicum** Torr. Sierra Mint. Stem simple, erect, 2 to 3½ feet high; herbage light green or grayish, pubescent or puberulent; leaf-blades ovate to ovate-lanceolate, serrulate along the sides, the acuminate apex and rounded or cordate base entire, 1½ to 3½ (or 5) inches long, sessile; calyx pubescent, the tips of the teeth very woolly exteriorly; corolla white, sprinkled with resin dots outside, its throat hairy, the lower lip purple-spotted.

Springy places on chaparral slopes, stream beds or mountain meadows, 1000 to 5300 feet: inner North Coast Ranges from Siskiyou Co. to western Tehama Co. and northern Humboldt Co.; Sierra Nevada from Shasta Co. to Fresno Co.; high mountains of Southern California. East to Nevada. May-August.

Locs.—North Coast Ranges: Sisson, Siskiyou Co., *Jepson* 5785; Delta (15 mi. s.), upper Sacramento River, *Heller* 11,696; Maxim Cabin, sw. Tehama Co., *Cronemiller* 826; Willow Creek, Trinity River Valley, n. Humboldt Co., *Tracy* 9637. Sierra Nevada: Whitmore, ne. Shasta Co., *Alma A. Weigart;* Clover Creek Cañon, Plumas Co., *Jepson* 8026; Hamilton sta. (betw. Big Oak Flat and Buck Mdws.), n. Mariposa Co., *A. L. Grant* 826; Corlew Mdw., Pine Ridge, Fresno Co., *Jepson* 13,296. S. Cal.: Devils Punch Bowl, San Gabriel Mts., *Peirson* 184; Green Valley, San Bernardino Mts., *Braunton* 1058; Palomar Mt., San Diego Co., *Jepson.*

Refs.—PYCNANTHEMUM CALIFORNICUM Torr.; Dur., Jour. Acad. Phila. ser. 2, 3:99 (1855), type loc. near Nevada City, *Pratten;* Jepson, Man. 878 (1925). *Koellia californica* Ktze., Rev. Gen. Pl. 2:520 (1891); Jepson, Fl. W. Mid. Cal. 465 (1901), ed. 2, 362 (1911).

18. **MONARDA** L.

Erect herbs with petioled leaves. Flowers in dense bracteate whorls in the upper leaf axils or in terminal heads. Calyx 15-nerved, with 5 equal teeth. Corolla rather large, strongly 2-lipped, abruptly dilated at throat, the upper lip narrow, entire or emarginate, the lower broader, with large middle lobe and 2 smaller lateral lobes. Fertile stamens 2, somewhat exserted. Rudiments of sterile stamens minute or none. Nutlets smooth.—Species about 18, North America. (N. Monardes, 1493–1588, Spanish writer, whose book, translated 1577 into English with the title "Joyfull Newes," gave the first account of the flora of North America.)

1. **M. pectinata** Nutt. Annual, the branches mainly from the base, 9 to 14 inches high; herbage puberulent; leaf-blades oblong, rather sparingly serrulate, 1 to 1½ inches long, short-petioled, the upper subsessile and ciliate toward base; flowers in 2 to 5 whorls, rarely a single whorl; bracts lanceolate, entire or nearly so, ciliate, equalling the calyces; calyx-teeth aristate, pilose; corolla yellowish-white, glandular-punctate, ½ inch long.

Gravelly hillsides, 4000 to 5000 feet: New York Mts., eastern Mohave Desert. East to Nebraska and Texas. July-Sept.

Loc.—Van Triggers, acc. *P. A. Munz*.

Ref.—MONARDA PECTINATA Nutt., Jour. Acad. Phila. ser. 2, 1:182 (1847), type loc. Santa Fé, N. Mex., *Gambel*.

19. **LAMIUM** L. HENBIT

Hairy herbs. Flowers in 1, 2 or 3 compact whorls. Calyx with 5 nearly equal awn-pointed teeth, much surpassed by the elongated corolla-tube. Corolla-tube much enlarged at the throat; upper lip erect or arched, entire or slightly notched; lower lip spreading, the middle lobe broad, the lateral lobes small and acute or toothlike. Anthers hairy in ours.—Species 40, Europe, Asia and Africa. (Greek laimos, throat, the corolla gaping.)

1. **L. amplexicaule** L. GIRAFFE HEAD. Low annual, decumbent at base; herbage scantily hairy or subglabrous, odorless; internodes below the inflorescence very long; leaves rounded, toothed or lobed, the lowest petioled and cordate, the floral clasping; corolla purplish-red, slender, 5 to 7 lines long, the upper lip bearded, the lower spotted; nutlets carinate on the face.

European weed, naturalized in grain fields, orchards, dooryards and garden corners, sometimes in wild habitats, 10 to 2000 feet: widely scattered in cismontane California, only slightly transmontane. Mar.-Aug.

Field note.—Lamium amplexicaule is a garden weed at Eureka. At this place it produces tiny cleistogamous flowers, the fully developed corollas being rather rare.—J. P. Tracy.

Locs.—Jess Valley, e. Modoc Co., *L. S. Smith* 1093; Redding, *Blankinship;* Anderson, Shasta Co., *Alice King;* Eureka, *Tracy* 13,380; Calistoga, *Jepson* 4019; St. Helena, *Clara A. Hunt;* Boulder Creek, Santa Cruz Mts., *V. F. Hesse* 135; Columbia, Tuolumne Co., *Jepson* 6347; Mariposa, *Congdon;* Michilinda, near Pasadena, *R. J. Dobbs;* San Bernardino, *J. B. Feudge* 3; Redlands, *J. B. Feudge* 4.

Refs.—LAMIUM AMPLEXICAULE L., Sp. Pl. 579 (1753), type European; Jepson, Fl. W. Mid. Cal. 458 (1901), ed. 2, 358 (1911), Man. 878 (1925).

Moluccella laevis L., Sp. Pl. 587 (1753); Jepson, Man. 879 (1925). SHELL-FLOWER. MOLUCCA BALM. Annual, about 1 foot high; leaf-blades orbicular, crenate; whorls 6-flowered; bracts spinose; calyx-base campanulate, nerved, expanded above into a very broad wing; corolla white, 2-lipped, shorter than the calyx.—Adventive from Europe: Berryessa Valley, Napa Co., in 1926; Brim ranch, foothills west of Williams, Colusa Co., in 1917; Contra Costa Co. in 1932. The calyx resembles a very broad-mouthed trumpet.

20. **HYPTIS** Jacq.

Herbs or shrubs. Calyx with 5 subequal teeth. Corolla short, the lobes of upper lip and lateral lobes of lower lip similar, plane, equal; middle lobe of lower lip with a transverse ridge or narrow fold at the contracted base and produced beyond into a bowl-shaped sac. Stamens 4, the upper pair shorter, all fertile, declined, included in the sac of the lower lobe.—Species over 300, North and South America. (Greek, huptios, turned back, referring to the lower lip.)

1. **H. emoryi** Torr. BEE SAGE. Shrub, the numerous straight erect slender stems forming a compact clump 4 to 8 or 12 feet high; herbage fragrant, white scurfy-tomentose; leaf-blades ovate, truncate at base, crenulate, ½ to 1 inch long, on short petioles; flowers in short-peduncled axillary clusters on the ends of the branchlets; pedicels nearly as long as calyx; calyx narrowly turbinate, white-scurfy or white-woolly with pinnately branched hairs, the teeth slender; corolla violet, 2 lines long, the upper lip with its lobes turned back to back; upper pair of stamens with hairy filaments, lower pair glabrous or nearly so.

Deep gravel of washes in desert cañons and on mesas, 350 to 2500 feet: eastern Mohave Desert and Colorado Desert. South to Lower California; east to Arizona and Sonora. Apr.-Oct.

Field note.—Hyptis emoryi, a handsome soft-gray shrub, is a fairly frequent species in the Colorado Desert as a scattered associate of Acacia greggii, Agave deserti, Fouquieria splendens, Yucca mohavensis, Larrea tridentata, Bebbia juncea, Beloperone californica and Encelia farinosa. Sometimes it is abundant. By way of illustration, a characteristic habitat is described. From the northeast side of San Felipe Valley, in eastern San Diego County, an old-time wagon-trail climbs over a low rocky ridge by an indistinct pass and descends through a wash (Wagon Wash) which joins San Felipe Creek near the lower end of Sentenac Cañon. For one and one-half miles in this broad wash Hyptis emoryi is a dominant. In this locality the clumps are often 12 to 14 feet high and 5 to 10 or even 21 feet broad. But everywhere, as an inhabitant of hill slopes or flats or cañons, quite around the west and north sides of the Colorado Desert, it occurs frequently, either as scattered individuals or in small colonies.

The base of the middle lobe of the corolla is abruptly retrocurved in such a way as to make a sharp ridge transversely just on the margin of the terminal sac. The ovary is seated on a white disk which is nectariferous. Everywhere in the desert bees work the flowers freely.

Locs.—Eastern Mohave Desert: Mopas Mts., *Ferris & Bacigalupi* 8232; Bagdad, *T. Brandegee;* Whipple Mts., Colorado River, *Jepson* 5222. Colorado Desert: Black Pt., Riverside Mts., *Jepson* 5250; Cottonwood Spr. (5½ mi. s.), near Eagle Mts., *Jepson;* Piñon Well, Conchilla Mts., *Jepson* 6016; Carrizo Cañon, w. of Indio Mt., *Clary;* Palm Cañon of Mt. San Jacinto, *Jepson* 1370; Palm Cañon of San Ysidro, *Jepson;* Vallecito, *Jepson* 8620; Myer's Creek bridge, foot of Mountain Springs grade, w. Imperial Co., *Jepson* 11,792.

Refs.—HYPTIS EMORYI Torr., Bot. Ives, 20 (1860), type loc. rocky arroyos, "Upper Colorado," *Newberry*, Jan. 14, 1857, that is between Explorers Pass (Jan. 12, 1857) and Canebrake Cañon (Jan. 15, 1857), a short distance above Fort Yuma (cf. J. C. Ives, Rep. on Colorado River of the West, pp. 46–47); Jepson, Man. 879 (1925). *Mesophaerum emoryi* Ktze., Rev. Gen. Pl. 2:526 (1891).

21. **MONARDELLA** Benth.

Low herbs sometimes woody at base. Herbage for the most part pleasantly fragrant. Flowers in heads, the heads terminal on the stems or branches and subtended by broad involucral bracts, which are often more or less colored. Calyx tubular, narrow, 10 to 15-nerved, the 5 teeth equal. Corolla purple, lavender, pink, or dull white; upper lip erect, 2-cleft, the lower 3-parted, horizontal or declined, all the lobes linear or narrowly oblong. Stamens 4, all fertile, strongly unequal or subequal, usually somewhat exserted.—Species 19, western North America. (Diminutive of Monarda, on account of its resemblance to that genus.)

Bibliog.—Gray, A., Monardella Benth. (Proc. Am. Acad. 11:100–102,—1876). Greene, E. L., New Species of Monardella (Pitt. 4:321–322,—1901; 5:80–87,—1902); Madronella (Lflts. 1: 168–169,—1906). Heller, A. A., [New species of Monardella], (Muhl. 1:34–37,—1904). Abrams, L. R., The Monardellas of S. Cal. (Muhl. 8:26–36,—1912). Epling, C. C., Monograph of the genus Monardella (Ann. Mo. Bot. Gard. 12:1–106,—1925).

Tax. note.—The annual species of Monardella form well-defined and readily separable groups, each with comparatively little variation within itself and apparently no intergradation with the others. The perennials present a totally different problem. With the exception of Monardella macrantha and Monardella nana, it seems certain that the perennial species are not distinct from each other in the same sense that the annual species are distinct. Reliance on single characters is not to be had in this perennial group. It is possible, however, to recognize certain groupings considered as species into which the great majority of individuals fall. The occurrence of occasional transitional forms need not detract from the working value of such groupings. A few narrow endemic forms of the perennial group such as Monardella cinerea, M. viridis and M. purpurea, are held distinct from the more widely distributed species. It should be noted, however, that these are represented by few collections and that more extensive field knowledge might reveal the lack of constant characters.

A. Flowers rather loose in the head; corolla-tube much longer than limb, exserted; calyx more than ½ inch long; low diffuse perennials; inner mountains of S. Cal.

Corolla scarlet or yellowish, 1 to 1½ inches long, the tube elongate-funnelform........1. *M. macrantha.*
Corolla white to pale rose, ¾ to 1¼ inches long, the tube filiform-cylindric......................2. *M. nana.*

B. Flowers typically densely capitate; corolla-tube but little longer than the limb; calyx less than ½ inch long; annuals or perennials.

1. Perennials, often from a woody root-crown.

Leaves rather thin, often broad, entire or sometimes serrate, not revolute-margined or only slightly so in no. 4.
Plants dwarf (commonly only 1 to 4 inches high), caespitose, ashy-grey; leaves 2 to 4 lines long; San Gabriel Mts..........3. *M. cinerea.*
Plants taller; pubescence various; leaves generally more than 5 lines long.
Bracts like the leaves in texture, green or sometimes purplish.
Bracts translucent in the spaces between the veins; leaf-blades entire; Napa Range and Mayacamas Range..........4. *M. viridis.*
Bracts entirely opaque; leaf-blades either toothed or entire; Coast Ranges and n. Sierra Nevada foothills..........5. *M. villosa.*
Bracts, at least the inner, membranous, usually whitish or purplish; leaf-blades entire.
Leaf-blades oblong-lanceolate to ovate, pubescent or usually minutely puberulent; stems rarely purple; plants mostly herbaceous; higher Sierra Nevada and higher inner North Coast Ranges..........6. *M. odoratissima.*
Leaf-blades linear to oblong.
Leaves strictly glabrous; stems purple; plants herbaceous; Del Norte Co.......... 7. *M. purpurea.*
Leaves as if glabrous and glaucous, but microscopically and finely gray-pubescent; woody-based or shrub-like plants; S. Cal., especially ranges bordering the deserts, and Inyo Co..........8. *M. linoides.*
Leaves thick, revolute-margined; rare.
Leaves entire, not fascicled; montane chaparral; cismontane S. Cal..........9. *M. hypoleuca.*
Leaves undulate-lobed, fascicled at the nodes; sand dunes on Santa Barbara coast line.......... 10. *M. crispa.*

2. Annuals from simple fibrous roots.

Bracts not at all white (except no. 11); calyx-teeth not white-tipped; corolla purple, rarely white.
Leaves strongly undulate-margined; coast line..........11. *M. undulata.*
Leaves plane, entire.
Bracts not at all scarious.
Bracts sparingly puberulent, pinnately veined; widely distributed..12. *M. lanceolata.*
Bracts villous, the veins parallel or only partly pinnate; San Bernardino Valley...... 13. *M. pringlei.*
Bracts scarious between the veins.
Bracts with numerous narrow veins, the scarious interspaces not conspicuous; leaves conduplicate; inner ranges from e. Alameda Co. to n. Ventura Co.......... 14. *M. breweri.*
Bracts with few prominent pinnate veins and conspicuous scarious interspaces; leaves plane; South Coast Ranges back of the coast..........15. *M. douglasii.*
Bracts with white margins or tips or wholly white; calyx-teeth white-tipped; corolla white.
Bracts partly white; calyx-teeth triangular-acute, not divergent; stamens exserted.
Bracts merely acute, narrowly white-margined; calyx 13-nerved, the teeth hirsute outside, in fruit nearly concealed; Sierra Nevada foothills..........16. *M. candicans.*
Bracts abruptly acuminate, with conspicuous white tips; calyx 15-nerved, the teeth merely scrobiculate or slightly if at all hirsute outside; s. Sierra Nevada in Kern Co. and w. Mohave Desert..........17. *M. exilis.*
Bracts wholly white; calyx-teeth subulate, divergent; stamens included; e. side San Joaquin Valley near Merced and Tuolumne rivers..........18. *M. leucocephala.*

1. **M. macrantha** Gray. (Fig. 440.) Stems simple or branched, puberulent or villous, 2 to 12 inches high, decumbent from creeping woody rootstocks; leaf-blades ovate, obtuse, entire or sometimes slightly toothed, glabrate or puberulent, ⅓ to 1¼ inches long, petioled; heads 2 to 18-flowered, the bracts leafy, narrowly ovate, acute or obtusish, villous-ciliate, 4 to 11 lines long; calyx 9 to 12 lines long, pubescent and somewhat glandular, sparsely villous within at the upper end, the 5 teeth nearly equal, subulate, the sinuses thickened; corolla scarlet, pubescent without, 1 to 1½ inches long, the tube narrowly funnelform, the lips 2½ lines long, the lobes of the lower linear, obtusish; stamens much exserted, the lower pair the longer, filaments sometimes sparsely pubescent.

Dry stony slopes, open coniferous forest and upper part of chaparral belt, 1500 to 5500 feet: Santa Lucia Mts.; San Gabriel, San Bernardino and Cuyamaca mountains. South to northern Lower California. June-July.

Locs.—Santa Lucia Mts.: Big Sur, *Davy* 7436; Burro trail, *K. Brandegee.* S. Cal.: West Fork San Gabriel River, near Sturtevant Camp, *Peirson* 183; City Creek road, San Bernardino Mts., *Peirson* 10,704; Julian, e. San Diego Co., *Dunn;* Cuyamaca Lake, *Munz & Harwood* 7241; Descanso, *T. Brandegee.*

Var. hallii Abrams. Habit laxly spreading, very floriferous; leaf-blades deltoid-ovate, thinly villous or ciliate, ½ to 1 inch long, the petioles 2 to 6 lines long, bracts and calyces glandular-pubescent to long villous.—San Bernardino Mts. to mountains of San Diego Co.: Mill Creek Cañon, San Bernardino Mts., *Parish* 4578; San Jacinto River Cañon, *Hall* 976; Palomar Mt. (betw. Cootca Valley and summit), *Jepson* 1547; Cuyamaca, *T. Brandegee.*

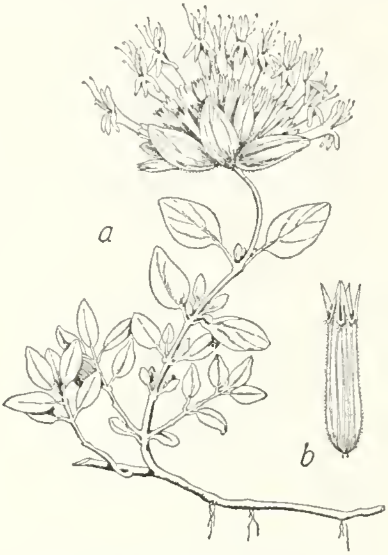

Fig. 440. MONARDELLA MACRANTHA Gray. *a*, habit, × ½; *b*, calyx, × 1.

Refs.—MONARDELLA MACRANTHA Gray, Proc. Am. Acad. 11:100 (1876), type loc. Cuyamaca Mts., *Palmer* 295 (cf. Ann. Mo. Bot. Gard. 12:35); Hook. f., Bot. Mag. t. 6270 (1876); Jepson, Man. 880, fig. 826 (1925). *Madronella macrantha* Greene, Lflts. 1:169 (1906), (cf. Ann. Mo. Bot. Gard. 12:3–4). Var. HALLII Abrams, Muhl. 8:29 (1912), type loc. Palomar Mt., *Hall* 1936. *Monardella macrantha* var. *longiloba* Abrams, l.c., type loc. San Jacinto River Cañon, *Hall* 976; Jepson, Man. 880 (1925). *Monardella macrantha* var. *tenuiflora* Hall, Univ. Cal. Publ. Bot. 1:110, pl. 11 (1902); not *Monardella macrantha* var. *tenuiflora* Gray, Syn. Fl. 2:459 (1886), which is based on M. tenuiflora Wats. in Gray, Proc. Am. Acad. 17:230 (1882).

2. **M. nana** Gray. Stems from creeping rootstocks, woody at base, simple or somewhat branched, ascending, 4 to 10 inches high; leaf-blades ovate to elliptic, entire, 4 to 13 lines long, short-petioled; corolla white or yellowish, rose-tinged, ¾ to 1¼ inches long, the lobes 3 lines long, the tube very slender (almost filiform), little exceeding the calyx; stamens little exserted.

Opens in chaparral or on wooded slopes, 4000 to 6000 feet: Palomar and Cuyamaca mountains, San Diego Co. South to Lower California. June-Aug.

Locs.—Palomar Mt., *C. V. Meyer* 232; Julian, *T. Brandegee;* Banner grade, *K. Brandegee;* betw. Cuyamaca and Oriflamme Cañon, *Abrams* 3941.

Var. **tenuiflora** Abrams. Smaller (3 to 3½ inches high), the leaves a little crowded; leaf-blades ovate to elliptic or oblong, 2½ to 4 lines long, pale green; bracts smaller, thinner.—Open pine forest, San Jacinto and Santa Rosa mountains and Palomar Mt., 4200 to 8600 feet: Mt. San Jacinto (betw. forks of summit trail and log cabin on upper trail, *Jepson* 2322; betw. Roach Mill and Deer Sprs., *C. V. Meyer* 530); Santa Rosa Indian Village, *Munz* 5833.

Var. **arida** Abrams. Tufted or densely branching from a woody base, 2 to 3 inches high; foliage lead-gray, the leaves numerous, but much reduced (the blades 2 to 4 lines long), much curled, crowded even to the extent of closely clothing the stem; bracts narrowly ovate, straw-white, sometimes purplish-tinged; corolla-lobes like frayed-cut paper.—Desert mountain slopes, Santa Rosa Mts., 4000 to 5000 feet: betw. Vandeventer ranch and Palm Cañon, *Jepson* 1336; Coyote Cañon, *Hall* 2127.

Refs.—MONARDELLA NANA Gray, Proc. Am. Acad. 11:101 (1876), type loc. "mts. behind San Diego" (that is, in the main range, e. San Diego Co.), *Cleveland;* Jepson, Man. 880 (1925). *M. macrantha* var. *nana* Gray, Syn. Fl. ed. 2, 2:459 (1886). *Madronella nana* Greene, Lflts. 1:169 (1906). *Monardella villosa* var. *leptosiphon* Torr., Bot. Mex. Bound. 129 (1859), type loc. San Felipe, *Parry.* *M. nana* var. *leptosiphon* Abrams, Muhl. 8:31 (1912). Var. TENUIFLORA Abrams, Muhl. 8:32 (1912); Jepson, Man. 880 (1925). *M. tenuiflora* Wats.; Gray, Proc. Am. Acad. 17:230 (1882), type loc. [Mt.] "San Jacinto, San Diego Co." [now Riverside Co.], *S. B. & W. F. Parish* 327. *M. macrantha* var. *tenuiflora* Gray, Syn. Fl., 2:459 (1886). *M. macrantha* var. *pinetorum* Hall, Univ. Cal. Publ. Bot. 1:110, pl. 12 (1902), type loc. Tahquitz Valley, San Jacinto Mts., *Hall* 725; Jepson, Man. 880 (1925). Var. ARIDA Abrams, Muhl. 8:33 (1912); Jepson, Man. 880 (1925). *M. macrantha* var. *arida* Hall, Univ. Cal. Publ. Bot. 1:111 pl. 10 (1902), type loc. Coyote Creek, sw. of Santa Rosa Mts., *Hall* 2127.

3. **M. cinerea** Abrams. Dwarfish plant, the spreading stems 1 to 4 inches long, very leafy, arising from a heavy branching root-crown; herbage with a close ashy-gray pubescence; leaf-blades ovate, sparingly or obscurely serrulate, 2 to 4 lines long, subsessile; heads 6 to 7 lines broad; bracts ovate, equaling or often much shorter than the calyces, both bracts and calyces usually wine-purplish; calyx-teeth lanceolate, spreading in age; corolla pale lavender, its tube not exserted.

Rock pockets or in coarse gravel of exposed ridges and talus slopes, 6000 to 9750 feet: Mt. San Antonio region of the San Gabriel Mts. June-July.

Geog. note.—This extremely narrow endemic, Monardella cinerea, is known only from the Mt. San Antonio district, where it has been collected on Mt. San Antonio (often called Mt. Baldy), *Peirson* 182, on Little Baldy and in the north fork San Antonio Cañon.

Refs.—MONARDELLA CINEREA Abrams, Muhl. 8:33 (1912), type loc. Mt. San Antonio, *Abrams* 1928; Jepson, Man. 880 (1925).

4. **M. viridis** Jepson. Stems ascending, ⅔ to 2 feet long, woody at base; leaf-blades rhomboidal to oblong-obtusish, slightly revolute-margined, light green and microscopically puberulent above, white-lanate beneath, 3 to 8 lines long, narrowed at base to a slender petiole; heads subglobose, 1 to 1⅛ inches broad, on long and almost naked peduncles; bracts ovate, densely pubescent, ciliate, the outer foliaceous but short; calyx glandular-dotted, the lanceolate teeth somewhat hirsute; corolla lavender.

Dry openly wooded foothills, 500 to 1500 feet: Napa Range and north to western Lake Co. July-Oct.

Locs.—Upper Conn Valley, Napa Range, *Jepson* 70e; Mt. St. Helena, *Jepson* 32f; Mt. Hanna, *Jepson* 100j.

Refs.—MONARDELLA VIRIDIS Jepson, Fl. W. Mid. Cal. 465 (1901), type loc. upper Conn Valley, Napa Range, *Jepson* 70d, ed. 2, 364 (1911), Man. 881 (1925). *Madronella viridis* Arthur, Torreya 21:12 (1921). *Monardella ledifolia* Greene, Pitt. 5:81 (1902), "Napa, Sonoma and perhaps Lake counties." *Madronella ledifolia* Greene, Lflts. 1:169 (1906).

5. **M. villosa** Benth. COYOTE MINT. (Fig. 441.) Stems several from the base, mostly simple, tough or somewhat suffrutescent at base, ¾ to 1½ feet high; herbage pubescent or villous to subglabrate; leaf-blades round-ovate to ovate-lanceolate, dark green, commonly more or less serrate, sometimes entire, 6 to 11 lines long, the veins conspicuous; petioles 2 to 3 lines long; bracts ovate to lanceolate, the outer often foliaceous, pinnately veined; calyx 4 lines long, pubescent or hirsute-pubescent, the teeth and upper end of tube hairy within; corolla dull white to pink or purple, pubescent within and without, the tube exceeding the calyx, the limb more than half as long as the calyx; stamens exserted or about equaling the linear lobes of the corolla; filaments glabrous or sparsely hairy.

Dry rocky ground in the hills or gravelly stream beds, 10 to 3000 feet: Coast Ranges (mostly back of the immediate coast line and eastward to the inner range) from San Luis Obispo Co. to Humboldt Co. May-Sept. It is also called Yerba Poles.

Note on variation.—In the factors of pubescence, leaf-shape and foliation of heads, Monardella villosa is an unstable aggregate. As an aggregate, sensu latissimo, it extends from the sea beaches of the ocean shores to the driest inner Coast Range, and is distributed from San Luis Obispo County northwards to Siskiyou County, thence south in the Sierra Nevada foothills at least as far as Mariposa County. Within this distribution area it has differentiated a considerable number of forms. Though these forms have not developed distinctive structural characteristics sufficient to mark them as separate entities, a certain portion or phase of each form that is most strongly or evidently differentiated is, for convenience, here described under a varietal name. While these varieties, so-called, are segregated geographically—some to a marked degree, some scarcely at all—it is to be emphasized that blocks or areas of intermediates or of shadowy divergences here and there tend to disqualify the described varieties which are in reality uneasy variants, and in this sense they are merely nominal. It is significant to observe that the degree of differentiation in the Coast Ranges, with its marked microclimatic areas, is very much greater than under the more uniform conditions of the Sierra Nevada foothills, where the representation is almost confined to a single slight but fairly constant phase, the var. glabella.

This species, Monardella villosa, was discovered at Bodega, Sonoma County, by R. B. Hinds, surgeon and botanist of the British exploring ship Sulphur, in 1837. His collection is preserved at Kew. The leaves in the type are not truncatish or subcordate at base as in the littoral var. franciscana but obtuse; they are hairy-pubescent beneath but not felt-like or white-tomentose as in var. franciscana (cf. Jepson, Californian Types at Kew, 294–295. 1906. ms.) The type, therefore, is represented by plants which lie, for the most part, back of the coast line or well towards the interior and are not strictly littoral. This representation, the typical form, is to all appearances the most widely distributed manifestation of the aggregate. Of it citations are set down as follows.

Locs.—San Carpojo, San Luis Obispo Co., *Condit;* Lorenzo Creek, upper San Benito River, *Bettys;* Carmel River, *Parish* 20,043; Glen Echo, Santa Cruz coast, *Jepson* 59g; Arroyo Mocho, n. end Mt. Hamilton Range, *Jepson* 14,986; Morrison Cañon, Niles, *Jepson* 59h; Mt. Diablo, *Bowerman* 339; Skyline Ridge, Berkeley Hills, *Jepson* 18,437; betw. Guerneville and Monte Rio, Russian River, *E. Ferguson* 221; Fort Bragg, *Mathews* 169; Garberville, s. Humboldt Co., *Jepson* 12,370; Grasshopper Peak, head of Canoe Creek, South Fork Eel River, *Jepson* 16,483; Dyerville, mouth of South Fork Eel River, *Jepson* 16,433; Somes Bar, Klamath River, *Chandler* 1522.

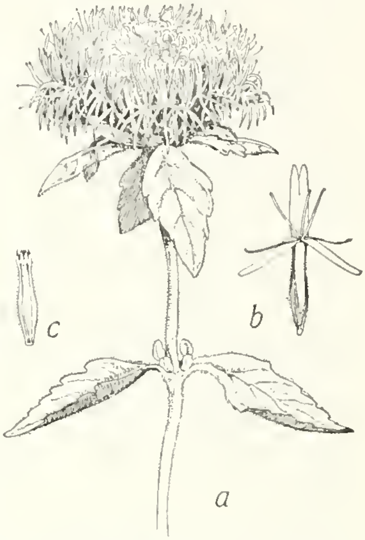

Fig. 441. MONARDELLA VILLOSA Benth. *a*, fl. stem, × 1; *b*, fl., × 1½; *c*, calyx × ½.

Var. **franciscana** (Elmer) Jepson. Stems reclining or diffuse, more or less woolly-pubescent; leaves broadly ovate, serrate to entire, pubescent above, especially the upper ones, white-woolly beneath, ½ to 1¾ inches long.—Coast line from Pt. Reyes to San Luis Obispo, 5 to 100 feet: Alamere Creek, 8 mi. n. of Bolinas, *Merle Randall;* betw. Mussel Rock and Salada, San Mateo Co., *Newlon* 253; Pajaro Hills, *Chandler* 366; San Luis Obispo (coast hills near), *Summers.* June-July.

Var. **obispoensis** Hoover var. n. Leaves round-ovate, usually entire, sometimes crenate, densely white-tomentose below, in strong contrast to the pubescent but green upper surface, hairs all branched; corolla white. (Folia ovata, plerumque integra, infra dense albo-tomentosa, supra viridia; capilli ramosi.)—Western San Luis Obispo Co.: Cuesta Pass (near), *Condit* (type); Perfumo Cañon, *Unangst;* Pine Mt., near San Simeon Bay, *Palmer.* The branched hairs are a remarkable feature. They have been observed in no other Monardella. A plant of the Nacimiento River, sw. Monterey Co., *Peirson* 11,829, grades towards this variety.

Var. **globosa** (Greene) Jepson comb. n. Leaf-blades broadly ovate, serrate, coarse, venose, thinly pubescent or tomentulose beneath when young, 1 to 1¾ inches long; heads large (1 to 1½ inches broad), the outer bracts foliaceous, conspicuous, strongly reflexed.—Hills on east side of San Francisco Bay, 50 to 800 feet: Oakland Hills, *Drew;* North Berkeley Hills, *H. A. Walker* 605; Martinez, *K. Brandegee.*

Var. **tomentosa** (Eastw.) Jepson. Stems and lower surface of leaves (especially the upper ones) and bracts, also the calyx, covered with soft gray pubescence; bracts foliaceous; heads terminal or sometimes smaller ones in the upper axils.—Dry flats or hillslopes from the Napa Range to central Mendocino Co.: Calistoga, *Jepson* 9969; Laytonville.

Var. **neglecta** (Greene) Jepson comb. n. Stems 4 to 14 inches high; herbage glabrous or microscopically puberulent, the stems, leaves and heads often purplish; leaf-blades ovate, serrulate, dark green, purple-veined, those of the basal sterile shoots 2 to 5 lines long, those of the flowering stems often larger (4 to 7 lines long); heads inclined to be small (6 to 12 lines broad); corolla purple.—Rocky slopes, Marin and Sonoma Cos.: Tiburon, *Jepson* 12,920; Mt. Tamalpais (Wheeler trail, *Howell* 5382; Rock Spring trail, *K. Brandegee*); betw. Graton and Occidental, *Hoover* 3609.

Var. subserrata (Greene) Jepson comb. n. Leaf-blades grayish-puberulent, serrulate (often obscurely so) or entire, 6 to 11 lines long.—Middle Coast Range from the Napa Range north to the region of Mt. Sanhedrin, and also in northeastern Lake Co.: Howell Mt., *Jepson* 50p; Hemlock, Mayacamas Range, *Jepson* 50k; Big Horse Mt., n. Lake Co., *Jepson* 30p; Allens Sprs., Lake Co., *Cleveland.*

Var. interior Jepson. Leaf-blades 1 to 1¼ inches long, coarsely and sometimes saliently few-toothed; heads large (1 to 1¼ inches broad).—Vaca Mts.

In the central Coast Ranges the prevailing biotype of Monardella villosa has broadly ovate leaves (sometimes nearly as broad as long) and a dark herbage with a marked pubescence consisting in some degree of slightly curved or curly hairs. The veins on the under side of the leaves are spreading, mainly regular and rather prominent. In Mendocino and Humboldt counties it passes by intergrades (such as Van Duzen River, opp. Buck Mt., *Tracy* 3961) into var. glabella Gray, the prevailing form of which has narrowly oblong or broadly lanceolate leaves 2 to 3 times as long as broad and a light-colored herbage which is subglabrate or furnished with a thin or minute pubescence of usually straight short hairs. The veins on the under side of the leaves are ascending, and usually less regular and less prominent than in the species. It is formally described as follows:

Var. glabella Gray. Leaf-blades lanceolate to ovate or oblong, usually entire, usually pale or often grayish, so scantily or finely puberulent as to appear glabrous, sometimes quite glabrous; outer bracts foliaceous, mostly shorter than the heads or merely equaling them; corolla nearly glabrous within, the lobes of the lower lip much more than ½ the length of the tube, the upper lip cleft for more than ½ its length.—Dry hillslopes, 500 to 3000 feet: Coast Ranges from eastern Mendocino Co. to western Siskiyou Co.; Sierra Nevada from Mariposa Co. to eastern Siskiyou Co. North to southern Oregon.

Locs.—North Coast Ranges: Covelo ranger sta., ne. Mendocino Co., *Cronemiller* 630; Willow Creek, n. Humboldt Co., *Tracy* 3476; Lamoine, Shasta Co., *Blankinship;* Humbug Creek, w. Siskiyou Co., *Butler* 169; West Fork Illinois River (head of), Del Norte Co., *Van Deventer* 180. Upper Sacramento Valley: Jelley's Ferry, Tehama Co., *Jepson* 18,983; Redding, *Blankinship;* lower Cow Creek, Shasta Co., *Blankinship.* Sierra Nevada: Alder Creek, Yosemite, *Hall* 1566; Confidence, Tuolumne Co., *Hoover* 3631; Washington Flat, betw. Altaville and Murphys, Calaveras Co., *Jepson* 40c; Ione, Amador Co., *Braunton* 1046; Brush Creek, Butte Co., *Conger;* Virgilia, Plumas Co., *Follett;* Davis Creek, Modoc Co., *R. M. Austin;* Dunsmuir, s. Siskiyou Co., *Condit;* Hornbrook, Klamath River, *Jepson* 19,974.

Refs.—MONARDELLA VILLOSA Benth., Bot. Sulph. 42, pl. 21 (1844), type loc. Bodega Bay, *Hinds;* Jepson, Fl. W. Mid. Cal. 465 (1901), ed. 2, 364 (1911), Man. 881, fig. 827 (1925). *M. villosa* var. *leptosiphon* Gray [by error "Torr."], in Gray, Syn. Fl. 2:357 (1876), and in Jepson, Man. 881 (1925); not M. leptosiphon Torr., Bot. Mex. Bound. 129 (1859). *Madronella villosa* Greene, Lflts. 1:168 (1906). *Monardella involucrata* Hel., Muhl. 1:34 (1904), type loc. near Del Monte, Monterey Co., *Heller.* *Madronella involucrata* Hel., Muhl. 1:138 (1906). *Monardella mollis* Hel., Muhl. 1:35 (1904), type loc. Tiburon peninsula, Marin Co., *Heller* 5725. *Madronella mollis* Hel., Muhl. 1:138 (1906). *Monardella coriacea* Hel., Muhl. 1:35 (1904), type loc. Healdsburg, *Heller* 5812. *Madronella coriacea* Hel., Muhl. 1:138 (1906). Var. FRANCISCANA Jepson, Man. 881 (Sept. 23, 1925). *Monardella franciscana* Elmer, Bot. Gaz. 41:320 (1906), type loc. San Pedro, San Mateo Co., *Elmer* 4766. *Monardella villosa* subsp. *euvillosa* var. *franciscana* Epling, Ann. Mo. Bot. Gard. 12:48 (Sept. 28, 1925). *Madronella franciscana* Hel., Muhl. 2:244 (1906). Var. OBISPOENSIS Hoover; type loc. Cuesta Pass, Santa Lucia Mts., *Condit.* Var. GLOBOSA Jepson. *Monardella globosa* Greene, Pitt. 5:82 (1902), type loc. Leona, Oakland Hills, Alameda Co., *Michener & Bioletti.* *Madronella globosa* Greene, Lflts. 1:169 (1906). Var. TOMENTOSA Jepson, Man. 881 (1925). *Monardella tomentosa* Eastw., Bull. Torr. Club 30:496 (1903), type loc. Laytonville, Mendocino Co., *Eastwood.* Var. NEGLECTA Jepson. *Monardella neglecta* Greene, Pitt. 5:82 (1902), type loc. Marin Co., *Vasey.* *Madronella neglecta* Greene, Lflts. 1:169 (1906). *Monardella odoratissima* var. *neglecta* Jepson, Man. 882 (1925). *Monardella villosa* subsp. *neglecta* Epling, Ann. Mo. Bot. Gard. 12:52 (1925). Var. SUBSERRATA Jepson. *Monardella subserrata* Greene, Pitt. 5:81 (1902), type loc. "Sonoma Co." (probably in the northeastern part), *Dunn.* *Madronella subserrata* Greene, Lflts. 1:169 (1906). *Monardella villosa* subsp. *subserrata* Epling, Ann. Mo. Bot. Gard. 12:48 (1925). Var. INTERIOR Jepson, Fl. W. Mid. Cal. 465 (1901), type loc. Weldon Cañon, Vaca Mts., *Jepson* 50n, ed. 2, 364 (1911), Man. 881 (1925). Var. GLABELLA Gray, Proc. Am. Acad. 7:386 (1867), based on *Monardella sheltonii* Torr. in Dur., Jour. Acad. Phila. ser. 2, 3:99 (1855), type loc. "Nevada" [City], Nevada Co., *Pratten.* *Monardella villosa* var. *sheltonii* Jepson, Man. 881 (1925). *Monardella villosa* subsp. *sheltonii* Epling, Ann. Mo. Bot. Gard. 12:50 (1925). *Monardella reflexa* Howell, Fl. Nw. Am. 1:549 (1901), type loc. Rogue River, Ore., *Howell.*

6. **M. odoratissima** Benth. Stems several from the base, commonly simple, 6 to 12 inches high; herbage often pale, puberulent or subglabrous; leaf-blades narrowly ovate to lanceolate, entire, ½ to 1⅜ inches long, petioled, the veins often

obscure; bracts ovate to lanceolate or often attenuate above, pinkish or purplish-tinged, pubescent, 3 to 6 lines long, the lower often somewhat foliaceous, ciliate towards base, the upper membranous, ciliate; calyx 3½ to 4½ lines long, more or less pubescent, the acute teeth white-hirsute without and within; corolla white, sometimes varying to rose-color or lavender, its tube more or less pubescent without and within, the expanded upper end of tube exserted from calyx, the lower lip 2 lines long, slightly exceeding the upper, about ½ the length of the tube, upper lip cleft for about ½ its length; stamens commonly slightly hairy at base, the longer pair exceeding the corolla-lobes.

Montane slopes and rocky ridges, 2300 to 9000 (or 11,150) feet: North Coast Ranges from Mendocino Co. to western Siskiyou Co.; Sierra Nevada from Tulare Co. to eastern Siskiyou Co.; White Mts. East to New Mexico and Colorado, north to Washington. June-Aug.

Note on variation.—Next to Monardella villosa, Monardella odoratissima is the most variable species of its genus in western America. Of all our perennial species of Monardella, it has by far the widest geographic distribution. Variation affects chiefly breadth of leaf, pubescence, and the number, size and shape of the outer or foliaceous bracts of the head. Variation in size of the heads is less marked. Variations in leafage, pubescence and bracts are, however, continuous and often terminate in a striking form, but forms of this sort are incapable of morphological delimitation and are usually without definite geographic significance. In the high Sierra Nevada, Monardella odoratissima is a frequent species everywhere, sometimes filling great open spaces in the forest, especially on ridges or plateaus. It is eagerly browsed by sheep. The leaves are used for a tea by shepherds in the White Mountains.

Locs.—North Coast Ranges: Potter Valley, e. Mendocino Co., *Purpus;* South Yollo Bolly, *Jepson* 100i; Buck Mt., Humboldt Co., *Tracy* 3928; Horse Mt., ne. Humboldt Co., *Tracy* 7657; McKay Camp, South Fork Mountain, Trinity Co., *Tracy* 8911; Mary Blaine Mt., Trinity Co., *Tracy* 14,480; Sisson, Siskiyou Co., *Jepson* 50c; Log Lake, Shackelford Cañon, Marble Mt., *Butler* 167. Sierra Nevada: Ruby Lake, Inyo Co., *Peirson* 11,317; Farewell Gap, Tulare Co., *Jepson* 1142; Alta Mdws., Tulare Co., *Newlon & Kelley* 31; Huntington Lake, *A. L. Grant* 1125; Kaiser Peak, *Jepson* 13,028; Shadow Lake, Madera Co., *A. L. Grant* 1577; Rancheria Mt., e. of Hetch-Hetchy Valley, *Jepson* 3404a; Kennedy Lake, e. Tuolumne Co., *A. L. Grant* 238; Big Mdw., Calaveras Co., *Jepson* 10,133; Echo Lake, Eldorado Co., *Ottley* 1179; Mt. Tallac, Lake Tahoe, *Jepson* 8153; Bear Valley, Nevada Co., *Jepson* 50a; Spanish Peak, Plumas Co., *Jepson* 19,322; Big Mdws., Plumas Co., *Platt;* Butte Lake, Lassen Co., *J. Grinnell;* Mineral, Tehama Co., *J. Grinnell;* Manzanita Lake, Lassen Peak, *Jepson* 15,289; Mt. Bidwell, Warner Mts., *Jepson* 7868; Mt. Shasta, *Jepson* 50b. White Mts.: Campito Mt., *Jepson* 7286.

Var. **ovata** (Greene) Jepson. Leaf-blades ovate, glabrous and glaucous, rounded or sometimes even sub-truncatish at base, 5 to 11 lines long, distinctly petioled; bracts thin, the subscarious portion purplish.—Modoc and Siskiyou Cos.: Warner Mts. (ridge betw. Eagle Mt. and Bear Mt.), *L. S. Smith* 1046; Mt. Shasta, *Jepson* 59f; Poker Flat, w. Siskiyou Mts., *Jepson* 18,538 (leaf-blades not glaucous, 8 to 14 lines long).

Var. **pinetorum** (Hel.) Jepson & Hoover comb. n. Leaves nearly glabrous above, short-pubescent beneath; corolla rose-purple.—Mt. Sanhedrin, w. Lake Co., *Heller* 5909 (the characters of this plant and its geographical position suggest a transition to M. viridis); also occurs on South Fork Kaweah River, Tulare Co., acc. Epling (Ann. Mo. Bot. Gard. 12:69).

Var. **australis** (Abrams) Jepson comb. n. Stems usually decumbent; bracts equaling or longer than the flowers; leaf-blades 3 to 7 lines long; upper lip of corolla cleft more than half-way to base.—Gravelly ground, open coniferous slopes, 6000 to 10,000 feet: San Jacinto Mts. (Tahquitz Valley, *Jepson* 2295; San Jacinto Peak, *Jepson* 2314) and San Bernardino Mts. (Little Bear Valley, *Chandler*).

Var. **parvifolia** (Greene) Jepson comb. n. Stems slender, often low and tufted; herbage pale or ashy, often stipitate-glandular; leaves oblong-lanceolate, not glaucous, reduced (3 to 6 lines long); heads smaller, ½ to ¾ inch broad, borne on nearly leafless peduncles; calyx-teeth white-hirsute or pilose.—High montane, on granite slopes or peaks, 8,000 to 10,300 feet: Sierra Nevada, east slope or easterly crests or plateaus, from Tulare Co. to Tuolumne and Mono Cos.: betw. Junction Camp (head of Kern Cañon) and Mt. Whitney, *Jepson* 1055; Cathedral Creek, Mariposa Co., *Hall* 11,904; Robinson Creek, Twin Lakes basin, w. Mono Co., *Peirson* 10,361; Saddlebag Lake, Tuolumne Co., *Bracelin* 36. East to Colorado.

Var. **follettii** Jepson var. n. Stems arising from a slightly woody base, strictly erect, microscopically puberulent, 9 to 22 inches high; leaf-blades oblong-ovate to narrowly oblong, glabrous, ½ to 1½ inches long, the uppermost small, the internodes long; heads in a narrow panicle or virgately racemose, often solitary and terminal, markedly glandular; bracts oblong, acute, shorter than, equalling or only slightly exceeding the calyces; calyces brownish or dusky, lightly pubescent, the teeth glandular-hirsutulose; corolla pink.—(Caules erecti, graciles suffrutescentes, 1½–2 ped. alti; herba glabra vel subglabra, bracteis calycibusque glanduloso-hirsutulosis; laminae foliorum oblongo-ovatae vel oblongae; bracteae oblongo-lanceolatae; capitula paniculata vel racemosa, rarius solitaria; bracteae oblongae acutae quam calycibus breviores aequantes vel subsuperantes; corolla rosea, fauce exserta).—Mountain slopes, 3700 to 4200 feet, Plumas Co.: Rich Gulch, ne. slope of Red Hill, *W. I. Follett* 108 (type); Meadow Valley, *W. I. Follett* 97. This plant recalls M. linoides var. stricta Parish in general aspect.

Refs.—MONARDELLA ODORATISSIMA Benth., Lab. Gen. et Sp. 332 (1834), "in petrosis ad flumen Columbia et in rupibus alpestribus in montibus White Mountains dictis, *Douglas*"; more specifically as defining type loc., above Kettle Falls of the Columbia River (acc. Ann. Mo. Bot. Gard. 12:60); Jepson, Man. 882 (1925). *Madronella odoratissima* Greene, Lflts. 1:168 (1906). *Monardella glauca* Greene, Pitt. 4:321 (1901), type from e. Ore., *Cusick* 1956. *Madronella glauca* Greene, Lflts. 1:169 (1906). *Monardella odoratissima* subsp. *glauca* Epling, Ann. Mo. Bot. Gard. 12:62 (1925). *Monardella modocensis* Greene, Pitt. 4:321 (1901), type loc. Modoc Co., *M. S. Baker*. *Madronella modocensis* Greene, Lflts. 1:169 (1906). *Monardella ingrata* Greene, Pitt. 5:83 (1902), type from se. Ore., *R. M. Austin*. *Madronella ingrata* Greene, Lflts. 1:169 (1906). *Monardella rubella* Greene, Pitt. 5:84 (1902), type loc. Verdi, Nev., *Sonne*. *Madronella rubella* Greene, Lflts. 1:169 (1906). *Monardella pallida* Hel., Muhl. 1:36 (1904), type loc. Donner Lake, *Heller* 6959. *Madronella pallida* Hel., Muhl. 1:138 (1906). *Monardella odoratissima* subsp. *pallida* Epling, Ann. Mo. Bot. Gard. 12:66 (1925). Var. OVATA Jepson, Man. 882 (1925). *Monardella ovata* Greene, Pitt. 5:82 (1902), type loc. Sisson, Siskiyou Co., *Brown* 381. *Madronella ovata* Greene, Lflts. 1:169 (1906). Var. PINETORUM Jepson & Hoover. *Monardella pinetorum* Hel., Muhl. 1:36 (1904), type loc. Mt. Sanhedrin, w. Lake Co., *Heller* 5909. *Madronella pinetorum* Hel., Muhl. 1:138 (1906). *Monardella odoratissima* subsp. *pinetorum* Epling, Ann. Mo. Bot. Gard. 12:68 (1925). Var. AUSTRALIS Jepson. *Monardella australis* Abrams, Muhl. 8:34 (1912), type loc. Tamarack Valley, San Jacinto Mts., *Hall* 2486; Jepson, Man. 883 (1925). *Monardella odoratissima* subsp. *australis* Epling, Ann. Mo. Bot. Gard. 12:70 (1925). Var. PARVIFOLIA Jepson. *Monardella parvifolia* Greene, Pl. Baker. 3:22 (1901), type loc. Black Cañon, Colo., *C. F. Baker* 678. *Madronella parvifolia* Rydb., Bull. Torr. Club 33:150 (1906). *Monardella odoratissima* subsp. *parvifolia* Epling, Ann. Mo. Bot. Gard. 12:69 (1925). *Monardella muriculata* Greene, Pitt. 5:84 (1902), type loc. West Humboldt Mts., Nev., *Greene*. *Madronella muriculata* Greene, Lflts. 1:169 (1906). Var. FOLLETTII Jepson; type loc. Rich Gulch, Plumas Co., *Follett* 108 (typ. in Herbario Jepsoniano).

7. **M. purpurea** Howell. Stems branching at base, slender, spreading, dark purple, often furnished with scattered microscopic glandular points or papillae, 6 to 8 inches high; leaf-blades oblong or a little contracted upward, obtuse, entire, bright green and quite strictly glabrous, slightly revolute-margined, 5 to 10 lines long, shortly petioled; bracts ovate to oblong-ovate, glabrous or nearly so but the margin ciliate, purplish on upper half; calyx purplish on upper half, the teeth markedly hirsute; corolla bright purple.

Open pine-covered mountain slopes, 1300 to 3100 feet: northern Del Norte Co. Also in southwestern Oregon. June-Aug.

Geog. note.—Monardella purpurea is one of the narrow endemics of a notable endemism center, namely southwestern Oregon and the adjoining northerly portion of Del Norte County in California. It is known thus far from the original station in Oregon and from Gasquet (*Van Deventer* 181), Camp Six (*M. S. Baker* 292c) and Shelley Creek (head of, *Parks & Tracy* 11,429) in Del Norte County, California. As so far understood its technical characters are weak as opposed to Monardella odoratissima.

Refs.—MONARDELLA PURPUREA Howell, Fl. Nw. Am. 550 (1901), type loc. e. base of the "Coast Mountains," sw. Ore., *Howell*. *Madronella purpurea* Nels., Bot. Gaz. 52:271 (1911), as to name only.

8. **M. linoides** Gray. Stems in rather dense rush-like clusters, 8 to 18 inches high, arising from a woody base; herbage pale gray, as if glabrous and glaucous, in reality clothed with a microscopic and very fine pubescence; leaf-blades linear to narrowly oblong, obtuse, entire, 6 to 11 lines long, mostly shorter than the internodes, the upper sessile, the lower shortly petioled; bracts varying greatly in size in a single head, broadly ovate to oblong-ovate, acute or obtuse, membranous, pale or pink, pinnately veined, ciliate; calyx 3 lines long, pubescent, with few resin dots, the teeth short, broadly subulate, pubescent without and within; corolla white or pink, its tube pubescent without and within, the upper lip cleft nearly to base.

Dry rocky slopes or ridges, 500 to 7000 feet: Cuyamaca Mts. and north to the

Santa Rosa and San Jacinto mountains. Including slightly modified forms (varietally named and described below), it ranges west to central San Diego Co., north to the San Bernardino Mts., San Gabriel Mts. (easterly part), Santa Lucia Mts., Mt. Piños region and Tehachapi Mts., southern Sierra Nevada in Tulare, Inyo and Kern counties, and the desert ranges of Inyo Co.; thence east to Nevada and Arizona. June-July.

Note on geog. variation.—In the ranges of the arid regions of Southern California and in the deserts Monardella linoides is a widely distributed species occurring in extremely scattered stations. A terrain so very wide and so diversified, mainly intramontane and transmontane but also cismontane in San Diego County, embraces various mountain systems and various minor climatic regions, in each of which forms of Monardella linoides with some slight differences have been developed, but these are less than usually assigned to the rank of variety. Variation in this species, as here accepted and described, is not so great as the synonymy would indicate. The forms represented by the names Monardella linoides, Monardella viminea, Monardella linoides var. stricta (or M. epilobioides), Monardella saxicola and Monardella anemonoides (and M. oblonga) all represent one natural type with only minor and inconstant divergences in size of heads and form and size of bracts. The outer bracts are markedly variable; sometimes they are foliaceous and twice exceeding the heads; sometimes reduced and shorter than the heads; or sometimes none. Nevertheless, a preponderance of the essential features in these various forms bears the stamp of one unit structurally, one biological type, and characterizes the group which occupies a definite and distinctive life area geographically. The typical form taxonomically, that is the original Monardella linoides, inhabits the Cuyamaca Mts. and extends north to the Santa Rosa and San Jacinto mountains. The leaves are mostly linear and very narrow; the bracts are orbicular or broadly ovate and mostly obtuse or shortly acute. The following stations may be cited: Cuyamaca Mts.; Coyote Cañon, *Hall* 2137; Santa Rosa Mts., *Munz* 5921; Tahquitz Valley, San Jacinto Mts., *Hall* 758; Palm Sprs. of Mt. San Jacinto (20 mi. s.), *Hall* 2430.

Westerly, northward and northwesterly from the region inhabited by typical Monardella linoides, five forms, for convenience named as varieties, are here described. Between typical Monardella linoides and these forms there are intermediates, but the forms have, nevertheless, some geographic significance. They are as follows:

Var. **viminea** Munz. Woody below, 2 feet high; leaf-blades linear-lanceolate; bracts ovate, acute.—Stream beds and foothill ravines, 10 to 1500 feet, western San Diego Co.: Poway, *Parish;* Murphy Cañon, *Epling;* San Diego, *T. Brandegee.* Although geographically well segregated, this form has little else to recommend its retention.

Var. **stricta** Parish. Leaves linear to oblong (3 to 8 lines long), the bracts oblong-ovate to ovate, acute or acuminate, and more commonly pink than in the typical form.—Montane slopes and cañons, 6400 to 9100 feet: east end of the San Gabriel Mts. (Le Montaine, near Swartout Valley, *Peirson* 3160); San Bernardino Mts. (Little Green Valley, *G. R. Hall;* Bear Lake, *Clokey* 7002; Gold Mt., *J. Grinnell;* Holcomb Valley, *Munz* 10,642; Mill Creek Cañon, *R. J. Smith;* Mt. San Gorgonio, *Geo. B. Grant;* South Fork Mdws., Santa Ana Cañon, *Hall* 7676). This form also occurs from southern Nevada through Arizona to Lower California.

Var. **palmeri** (Gray) Jepson. Stems low, 4 to 6 inches high; leaf-blades oblong, obtuse, glabrous or finely glandular; bracts ovate to oblong-lanceolate, obtuse, purplish; calyx-teeth linear-lanceolate.—"Among redwoods," Santa Lucia Mts., coast of Monterey Co. This form is very close to certain forms of the var. stricta.

Var. **anemonoides** (Greene) Jepson. Somewhat coarser than in M. linoides; stems a little peduncle-like above, the terminal heads with their somewhat enveloping petaloid bracts presenting the aspect of a one-flowered species of Anemone; leaves oblong; heads larger than in the typical form (¾ to 1½ inches broad, but small-headed forms also occur); bracts orbicular to ovate, obtuse or more commonly acute or acuminate.—Rocky slopes, 4500 to 8500 feet: mountains of northern Ventura Co. (Frazier Mt., *Dudley & Lamb* 4542; Mt. Piños, *J. Grinnell*); Tehachapi Mts. (Bisses sta., *Dudley* 476); east slope or easterly ridges and flats of the southern Sierra Nevada from Kern Co. to Mono Co. (Pah Ute Peak, Kern Co., *Purpus* 5096; Kernville, *Hall & Babcock* 5095; Monache Creek, Olancha Mt., *Hall & Babcock* 5268; Trout Mdws., e. Tulare Co., *Hall* 8380; Cottonwood Creek, w. Inyo Co., *Purpus* 1947; near Convict Lake, sw. Mono Co., *Almeda Nordyke*); Inyo Co. ranges (Argus Peak, *Purpus* 5089; Big Pine, 10 mi. ne., *Keck* 534). In its extreme and most robust form, with the broad acute or acuminate bracts conspicuously exceeding the flowers, the var. anemonoides is a truly striking plant; but variations of it, in which the broad bracts, rounded at apex and shortly acute, are shorter than the flowers or merely equal them, are not uncommon.

Var. **saxicola** (Jtn.) Jepson comb. n. Leaves olive-green above, pale beneath; bracts orbicular-ovate to ovate, brownish, pubescent, ciliate.—Dry rocky ridges and slopes in the chaparral belt, 4000 to 5200 feet, region of San Antonio Cañon, San Gabriel Mts.: Browns Flats; Evey Cañon, *Johnston* 1440; Cucamonga Peak, *Johnston* 2050. There is in this variety a wide range in leaf-size in one collection, as also frequently in var. anemonoides (cf. Big Pine Creek, Inyo Co., *R. S. Ferris* 8983). The inner bracts in var. saxicola are mostly shorter than the flowers; the outer bracts are mostly conspicuously foliaceous. In var. anemonoides the inner bracts are sometimes longer, sometimes shorter than the flowers, the outer bracts are foliaceous or sometimes none, even in one collection.

Refs.—MONARDELLA LINOIDES Gray, Proc. Am. Acad. 11:101 (1876), "mts. e. of San Diego," *Palmer* (that is, Oriflamme Mine, Cuyamaca Mts.; cf. Bot. Cal. 1:94); Jepson, Man. 882 (1925). *Madronella linoides* Greene, Lflts. 1:169 (1906). Var. VIMINEA Munz, Man. 450 (1935). *Monardella viminea* Greene, Pitt. 5:85 (1902), type loc. "mts. of San Diego Co.," *Vasey;* Jepson, Man. 882 (1925). *Madronella viminea* Greene, Lflts. 1:169 (1906). Var. STRICTA Parish, Erythea 7:96 (1899), type loc. Bear Valley, San Bernardino Mts., *Parish* 2077; Jepson, Man. 882 (1925). *Monardella linoides* subsp. *stricta* Epling, Ann. Mo. Bot. Gard. 12:74 (1925). *Monardella epilobioides* Greene, Pitt. 5:85 (1902), type loc. Bear Valley, San Bernardino Mts., *Parish. Madronella epilobioides* Greene, Lflts. 1:169 (1906). *Monardella epilobioides* var. *erecta* Abrams, Muhl. 8:36 (1912), type loc. Bear Valley, San Bernardino Mts., *Abrams* 2861. *Monardella robisonii* Epling in Munz, Man. 451 (1935), type loc. Keyes ranch, Little San Bernardino Mts. (Conchilla Range), *Epling & Robison.* Var. PALMERI Jepson, Man. 882 (1925). *Monardella palmeri* Gray, Proc. Am. Acad. 12:82 (1877), type loc. "Redwood forests on Santa Lucia Mts.," *Palmer. Madronella palmeri* Greene, Lflts. 1:169 (1906). Var. ANEMONOIDES Jepson, Man. 882 (1925). *Monardella anemonoides* Greene, Pitt. 5:86 (1902), type loc. Greenhorn Mts., Kern Co., *Palmer. Madronella anemonoides* Greene, Lflts. 1:169 (1906). *Monardella oblonga* Greene, Pitt. 5:83 (1902), type loc. mts. s. of Tehachapi town, *Greene. Madronella oblonga* Greene, Lflts. 1:169 (1906). *Monardella linoides* var. *oblonga* Munz, Man. 450 (1935). Var. SAXICOLA Jepson. *Monardella saxicola* Jtn., Bull. S. Cal. Acad. 18:19 (1919), type loc. near Browns Flats, e. San Gabriel Mts., *Johnston* 2133. *Monardella hypoleuca* var. *saxicola* Jepson, Man. 882 (1925). *Monardella viridis* subsp. *saxicola* Ewan, Bull. Torr. Club 64:521 (1937).

9. **M. hypoleuca** Gray. Stems simple or somewhat branched, reddish-brown, puberulent, 1 to 2 feet high; leaf-blades oblong-lanceolate, revolute-margined, entire, obtuse, ½ to 1½ inches long, petioled, the lower surface densely white-tomentose, the upper green and glabrous (rarely sparsely hairy), the veins prominent; flower-heads dense, rounded, 8 to 12 lines broad; bracts ovate, obtuse, pubescent, villous-ciliate, purplish, punctate below with resin dots, ½ inch long, longer than the calyx; calyx 3 lines long, villous without, glabrous within; corolla white, pubescent without, the tube equaling the calyx-tube, the limb more than ½ as long; filaments exserted, very sparsely hairy.

Opens in montane chaparral, 500 to 4000 feet: Santa Barbara Co. to San Diego Co. July-Sept.

Geog. note.—The stations for Monardella hypoleuca are infrequent and it is to be regarded as one of the rarer endemics in this genus. It has been collected near Santa Barbara, *Niedermüller* (leaves glabrous above, or a few short hairs microscopically evident); in Topanga Cañon, Santa Monica Mts. (Muhl. 3:114); in Malibu Cañon, Santa Monica Mts., *Barber* (leaves thinly hirsutulose above, the stems beneath the heads villous); on Palomar Mt., *Schellenger* (leaves glabrous above); near Alpine, San Diego Co., *Abrams* 4896 (leaves pubescent above, the stems villous or subtomentose beneath the heads). The specimen last cited represents Monardella lanata Abrams, in which all parts of the plant, including the calyces, are more hairy than in the plant of the Santa Inez Mts., but the intermediates form a continuous series. It seems not to be known where, in the vast extent of cismontane and transmontane San Bernardino County, Parry and Lemmon discovered the species, but these two botanists collected together in the San Bernardino Mts., a region still worth exploring for rarities and novelties. A plant collected between Holy Jim Cañon and Santiago Peak, Santa Ana Mts., *Munz* 7742, has the leaves puberulent above, the inflorescence branched, the heads small (5 to 8 lines wide) and the corollas much exserted. It is doubtless pathological.

Refs.—MONARDELLA HYPOLEUCA Gray, Syn. Fl. 2:356 (1878), type loc. San Bernardino Co., *Parry & Lemmon. Madronella hypoleuca* Greene, Lflts. 1:169 (1906). *Monardella robusta* Elmer, Bot. Gaz. 39:46 (1905), type loc. Santa Barbara, *Elmer* 3728. *Monardella lanata* Abrams, Muhl. 8:39 (1912), type loc. Descanso grade, San Diego Co., *K. Brandegee;* Jepson, Man. 881 (1925).

10. **M. crispa** Elmer. Perennial bushy plant, 1 to 1½ feet high, the stems several from the stout taproot and woody below, tomentulose above, bearing nearly throughout conspicuous leaf fascicles at the nodes; leaf-blades oblong, ½ to 1 inch long, puberulent, the margin revolute in such a manner as to produce a lobed or irregularly undulate leaf; heads ¾ to 1¼ inches broad, the bracts ovate, 6 to 8-nerved; corolla purplish.

Sand hills and beaches, 5 to 80 feet: north coast of Santa Barbara Co. May-July.

Field note.—Monardella crispa has been collected at Surf, *K. Brandegee*, and at Guadalupe, *Condit*. On the Nipomo Mesa, it occurs, acc. to C. B. Wolf, on moving sand dunes and not on stabilized ones, the stems elongating upward as a dune grows, and sometimes forming coarse plants 3 to 5 feet across. This species, certainly perennial, must be regarded as distinct from Monardella undulata.

Refs.—MONARDELLA CRISPA Elmer, Bot. Gaz. 39:46 (1905), type loc. Surf, Santa Barbara Co., *Elmer* 3965; Jepson, Man. 893 (1925). *M. undulata* var. *crispa* Epling, Ann. Mo. Bot. Gard. 12:77 (1925).

11. **M. undulata** Benth. Stems diffusely or loosely branched, reddish-brown, 5 to 15 inches high; herbage minutely hispidulose or subglabrous; leaf-blades oblong-oblanceolate to linear, obtuse, undulate-margined, 3/4 to 2 inches long, shortly petioled or subsessile, often with smaller leaves fascicled in the lower axils; heads 3/4 to 2 inches broad; bracts broadly ovate or almost orbicular, thin and somewhat scarious, whitish or pinkish, obtuse or acute, without cross-veinlets between the conspicuous parallel nerves; calyx-teeth triangular or a little oblong, somewhat blunt, not cuspidate; corolla rose-purple.

Sandy coastal hills and flats, 10 to 300 feet: Marin Co. to Santa Barbara Co. May-July.

Locs.—Pt. Reyes, Marin Co., *W. S. Cooper* 74; Lake Merced, San Francisco, *K. Brandegee;* Gigling sta., Monterey Bay, *E. Ferguson* 273; Del Monte Heights, Monterey Co., *W. S. Cooper* 23; Oceano, San Luis Obispo Co., *W. S. Cooper;* Arroyo Grande, San Luis Obispo Co., *Condit;* Bishop ranch, Sisquoc River, Santa Barbara Co., *M. S. Baker.*

Refs.—MONARDELLA UNDULATA Benth., Lab. Gen. et Sp. 332 (1834), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 464 (1901), ed. 2, 363 (1911), Man. 883 (1925). *Madronella undulata* Greene, Lflts. 1: 168 (1906).

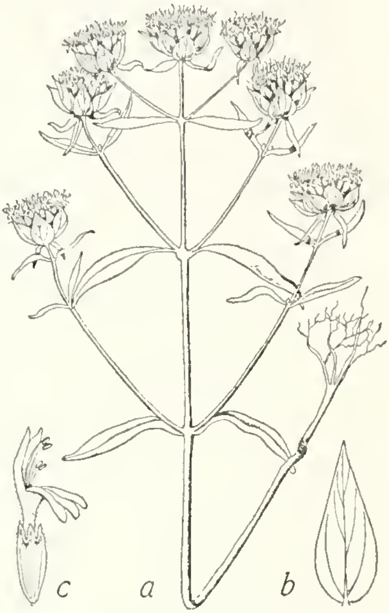

Fig. 442. MONARDELLA LANCEOLATA Gray. *a*, habit, × 1/3; *b*, bract of involucre, × 1½; *c*, fl., × 1½.

12. **M. lanceolata** Gray. MUSTANG MINT. (Fig. 442.) Stem simple or decussately branched above, glabrous below, puberulent above, 1/4 to 2½ feet high; leaf-blades lanceolate to oblong-lanceolate, entire, 1/2 to 2 inches long, narrowed to a petiole 1 to 2 lines long; bracts ovate to ovate-lanceolate, acute, glandular, minutely ciliate, the outer foliaceous, the inner often purplish; calyx pubescent, the acute teeth ciliate; corolla rose-purple (varying to white), its lobes long and narrow, concolorous or purple-dotted.

Open ground of foothill slopes or mountain flats, towards the south on valley floors, (400 or) 1000 to 6500 feet: Sierra Nevada from Shasta Co. to Kern Co.; Tehachapi Mts. and San Luis Obispo Co.; cismontane Southern California from Santa Barbara Co. to San Diego Co. East to western Nevada. May-Aug.

Locs.—Sierra Nevada (west slope): Sims sta., upper Sacramento River, *Jepson* 50g; Montgomery Creek, Shasta Co., *M. S. Baker;* Forest ranch, Butte Co., *Heller* 11,628; Downieville, *Eva Kennedy;* Weeds Point (e. of), Yuba Co., *Jepson* 16,775; Snowdon ranch, 3 mi. below Calaveras Grove, *Jepson* 50f; Hetch-Hetchy, *Jepson* 3437; Cedar Brook, s. Mariposa Co., *Jepson* 8403; Mono Hot Sprs., South Fork San Joaquin River, *A. L. Grant* 1502; Redwood Creek, East Fork Kaweah River, *Jepson* 1160; Middle Tule River, *Purpus* 1357; Bald Mt., Greenhorn Mts., Kern Co., *C. N. Smith* 203. Sierra Nevada (east slope): Sierra Valley, Sierra Co.; Fallen Leaf Lake, Eldorado Co.; Woodford sta., Alpine Co., *Ottley* 1139. Tehachapi Mts.: near Tehachapi Peak, *Dudley* 348; Ft. Tejon, *Parish.* "San Luis Obispo district," *Palmer.* S. Cal.: Cuddy Valley, Mt. Piños, *Epling & Dunn;* Sisquoc, Santa Barbara Co., *M. S. Baker* 7; Fish Cañon, San Gabriel Mts., *Peirson* 511;

Lake Arrowhead, San Bernardino Mts., *Braunton* 1040; Bloomington, San Bernardino Valley, *Parish* 11,268; Saunders Mdw., San Jacinto Mts., *C. V. Meyer* 624; Hemet Valley, *Clary* 978; Cootca Creek, Palomar Mt., *Jepson* 1549; Valley Center, San Diego Co., *C. V. Meyer* 243; Cuyamaca Mts., *T. Brandegee;* Julian, *Dunn.*

Geog. note.—Monardella lanceolata is widely distributed throughout the Sierra Nevada from end to end of the range. Altitudinally it occurs on the west slope from Sanger, Fresno Co., 400 feet, and Washington Flat, Calaveras Co., 1400 feet, to Mono Hot Springs in Fresno Co. at 6300 feet. It is also transmontane on the east slope of the Sierra Nevada, as at Sierra Valley (*Lemmon*) and Lake Tahoe (*Parry*). It has not been reported from the North Coast Ranges, nor from any definite station in the South Coast Ranges, although there is one vague record for San Luis Obispo County. Throughout the Sierra Nevada it is uniform in character and aspect, save that at high altitudes, as at Fallen Leaf Lake, 6450 feet (*Ottley* 907), it becomes depauperate. Towards the south it tends to develop certain quite minor variations as follows: Var. SANGUINEA (Greene) Jepson, merely a dark red-purple color form.—Southern Sierra Nevada in Tulare Co. (Old Colony Mill, *K. Brandegee*); San Diego Co. (Palomar Mt., *Esther Hewlett* 39; Witch Creek, *Alderson* 8599). Var. GLANDULIFERA Jtn. Upper parts of the stem, also the leaves and bracts, provided with short gland-tipped hairs or processes; corolla red-purple, its tube and throat glandular.—San Antonio Mts.; Palomar Mt. (*C. V. Meyer* 500). Var. MICROCEPHALA Gray. More slender; heads much smaller (½ inch across); bracts 2 to 3 lines long.—Mountain valleys of east central San Diego Co., 2000 to 4000 feet: Tighe ranch, e. of Ramona, *Palmer* 294; betw. Campo and Buckman Sprs., *Howell* 2975. South to Lower California.

Refs.—MONARDELLA LANCEOLATA Gray, Proc. Am. Acad. 11:102 (1876), "Cal., from Plumas to San Diego Co."; Jepson, Fl. W. Mid. Cal. 464 (1901), ed. 2, 463 (1911), Man. 883, fig. 828 (1925). *Madronella lanceolata* Greene, Lflts. 1:169 (1906). Var. SANGUINEA Jepson, Man. 883 (1925). *Monardella sanguinea* Greene, Pitt. 5:86 (1902), type loc. Julian, San Diego Co., *Dunn. Madronella sanguinea* Greene, Lflts. 1:169 (1906). Var. GLANDULIFERA Jtn., Bull. S. Cal. Acad. 18:20 (1919), type loc. Browns Flats, San Antonio Mts., *Johnston* 2139; Jepson, Man. 883 (1925). Var. MICROCEPHALA Gray, Syn. Fl. ed. 2, 2:459 (1886), type loc. Potrero, *Orcutt* 928; Jepson, Man. 883 (1925). *Monardella peninsularis* Greene, Pitt. 5:87 (1902), type from L. Cal., *Orcutt. Madronella peninsularis* Greene, Lflts. 1:169 (1906).

13. **M. pringlei** Gray. Stem simple or branched, 10 to 12 inches high; herbage finely pubescent, sometimes glandular above; leaf-blades oblong to broadly lanceolate, entire, ½ to 1½ inches long, tapering to a petiole; heads 6 to 11 lines broad, very compact; bracts broadly ovate, abruptly acuminate, purple-tipped, strongly veined, without cross-veinlets, pubescent, also ciliate, 3 to 4 lines long; calyx pubescent, the teeth lanceolate-subulate, markedly hairy within; corolla purple, its tube exserted.

Sand hills and low sandy ridges, 980 to 1200 feet: San Bernardino Valley. May-June.

Geog. note.—Monardella pringlei is an extremely narrow endemic of the San Bernardino Valley. Confined to a restricted district about five by six miles in area, it extends from Colton (*Parish* 1881) to San Bernardino (*Parish* 3653) and Rialto. Thus far it has never been collected beyond this small portion of the valley floor.

Refs.—MONARDELLA PRINGLEI Gray, Proc. Am. Acad. 19:96 (1883), type loc. Colton, San Bernardino Valley, *Pringle;* Jepson, Man. 883 (1925). *Madronella pringlei* Greene, Lflts. 1:169 (1906).

14. **M. breweri** Gray. Stem ½ to 2 feet high; herbage finely scabrous-pubescent; leaf-blades oblong or narrowly ovate, entire, ¾ to 1¼ inches long, short-petioled; bracts broadly ovate, abruptly acuminate-cuspidate, the outer pinnately 7 to 9-ribbed, the inner with the ribs parallel and converging to the point, the narrow interspaces light-colored and scarious; calyx-teeth triangular-lanceolate, acute, ciliate; corolla rose-color or lavender, the tube much surpassing the calyx.

Mountain flats back of the coast and floors of the inner valleys, 800 to 4500 feet: South Coast Ranges (especially the inner range) from Alameda Co. to San Luis Obispo Co.; Southern California from the Liebre Mts. and Mt. Piños to the upper Santa Clara River. June-Aug.

Locs.—Corral Hollow, e. Alameda Co.; upper Nacimiento River, *Hoover* 2681; San Miguelito ranch, San Antonio River valley, Monterey Co., *Jepson* 1647; Lorenzo Creek, upper San Benito River, *Bettys;* Cholame Creek, se. Monterey Co., *Jepson* 15,912; La Panza, Pozo Range, *Birma S. MacLean.* S. Cal.: Lockwood Creek Cañon, Mt. Piños, n. Ventura Co., *Dudley & Lamb* 4668; Liebre Mts. (Ann. Mo. Bot. Gard. 12:85); Acton (Ann. Mo. Bot. Gard. 12:85).

Refs.—MONARDELLA BREWERI Gray, Proc. Am. Acad. 7:386 (1867), type loc. Corral Hollow, n. end Mt. Hamilton Range, *Brewer* 1213; Jepson, Fl. W. Mid. Cal. 464 (1901), ed. 2, 363 (1911), Man. 884 (1925). *Madronella breweri* Greene, Lflts. 1:168 (1906). *Monardella elmeri* Abrams, Muhl. 8:43 (1912), type loc. Acton, *Elmer* 3681; Jepson Man. 884 (1925).

15. **M. douglasii** Benth. (Fig. 443.) Stems loosely branched, 4 to 12 inches high; herbage below bracts pubescent, often hispidulous; leaf-blades narrowly oblong or lanceolate, entire, ¾ to 1½ inches long, short-petioled, the upper somewhat resinous-dotted; heads on terminal or axillary peduncles; bracts ovate and ovate-lanceolate, cuspidate, resinous-dotted, with strong pinnate ribs confluent along the margin and hirsutulose, the spaces between them silvery-scarious; calyx sparingly hirsute-pubescent above, the teeth triangular-lanceolate, hirsute within, in age connivent at their tips; corolla deep purple, the tube little exserted beyond the cuspidate calyx-teeth; lobes of upper lip ending in a cup-like gland, the 3 lower lobes also ending in a gland, or only one of them glandular.

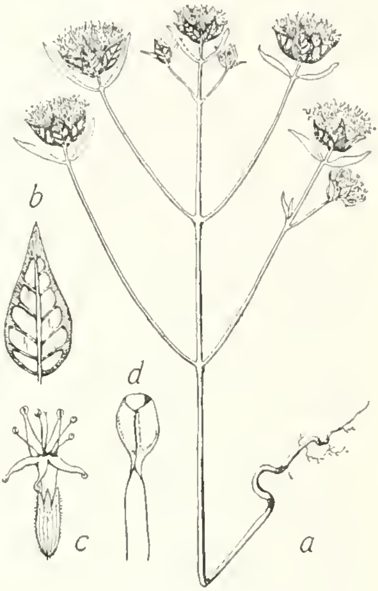

Fig. 443. MONARDELLA DOUGLASII Benth. *a*, habit, × ⅓; *b*, bract of involucre, × 1½; *c*, fl., × 1½; *d*, gland, × 12.

Hillslopes, 500 to 3500 feet: Coast Ranges from Contra Costa County to southeastern Monterey Co., mostly in the inner range, not in the outer range save occasionally on the east slope. June-July.

Geog. note.—Of interest for its fenestrate bracts, which are suggestive of the wings of certain Neuropteran insects, Monardella douglasii is a well-marked endemic of the South Coast Ranges back of the coast, best known in the inner range. Its longitudinal distribution, as to its typical form, covers about 150 miles. Within its range it is relatively a rare plant, or at least infrequently collected: Donner Cañon, Mt. Diablo, *Bowerman* 2327; Moraga Valley, *Bolander* 2499; Oakland Hills, *Drew;* Mt. Hamilton, *R. J. Smith;* Gilroy (hills w.), *Jepson* 50j; Stone Cañon, se. Monterey Co., *Condit*.

Var. **venosa** (Torr.) Jepson. Stouter, about 6 inches high; bracts broadly ovate, larger (equaling or exceeding corollas), purplish, strongly hirsute-ciliate, with larger fenestrae, the hairs of the fenestrae reduced and scarcely evident.—East side of the Sacramento Valley, apparently very rare: Marysville; Chico.

Refs.—MONARDELLA DOUGLASII Benth., Lab. Gen. et Sp. 332 (1834), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 464 (1901), ed. 2, 363 (1911), Man. 884, fig. 829 (1925). *Madronella douglasii* Greene, Lflts. 1:168 (1906). Var. VENOSA (Torr.) Jepson. *Monardella candicans* Benth. var. *venosa* Torr., Pac. R. Rep. 4:123 (1857), type loc. plains of Feather River, near Marysville, *Bigelow*. *Monardella douglasii* var. *parryi* Jepson, Man. 884 (1925), type loc. Chico, Butte Co., *Parry*.

16. **M. candicans** Benth. Stem simple below, somewhat branched above, 5 to 15 inches high; herbage puberulent; leaf-blades lanceolate to oblong, obtuse, entire, ½ to 1½ inches long, petioled; bracts ovate, acute or obtuse, hirtellous, greenish with a very narrow white border, the areas between the parallel nerves scarious but with cross veinlets; calyx-tube microscopically puberulent, its broad teeth white-tipped, villous; corolla white, its tube moderately exserted.

Dry shaded hillslopes, 500 to 2500 feet: Sierra Nevada foothills from Nevada Co. to Kern Co. May-June.

Geog. note.—Monardella candicans, an extremely well-marked species, is not an abundant plant and the known localities are comparatively few. As with many other species endemic in the Sierra Nevada foothills, its distribution is featured by a gap, namely, the Kaweah River system, as it ranges south.

Locs.—Auburn, Placer Co. (Ann. Mo. Bot. Gard. 12:88); Sweetwater Creek, Eldorado Co., *K. Brandegee;* Copperopolis, Calaveras Co., *Davy* 1334; Oakdale (8 mi. e.), *Hoover* 1036; Agua

Fria, Mariposa Co., *Congdon;* Fresno Creek above Raymond, Madera Co., *Hall* 10,043; Roger Valley (3 mi. n. of Auberry), Fresno Co., *Jepson* 12,887; Badger, Tulare Co., *T. Brandegee;* Blue Mountain foothills, Kern Co., *Hall & Babcock* 5005.

Refs.—MONARDELLA CANDICANS Benth., Pl. Hartw. 330 (1849), type loc. "in locis aridis montium Sacramento," *Hartweg* 348, that is, right bank of the Yuba River, Sierra Nevada foothills (cf. Jepson, Erythea 5:56); Jepson, Fl. W. Mid. Cal. 464 (1901), ed. 2, 363 (1911), Man. 884 (1925). *Madronella candicans* Greene, Lflts. 1:168 (1906).

17. **M. exilis** Greene. Stem branching from the base or simple, 5 to 12 inches high; herbage puberulent; leaf-blades narrowly oblong, entire, ½ to 1 inch long, the upper ones acute; flower-heads ½ to ¾ inch broad; bracts abruptly acuminate, often purplish, conspicuously white-margined, the veins parallel, with few or no cross-veinlets; calyx-teeth triangular-lanceolate, slightly hirsute; corolla white, the tube scarcely exserted.

Sandy flats, desert hills or mesas, 2000 to 4000 feet: southern Sierra Nevada in Kern Co.; western Mohave Desert. Apr.-June.

Tax. note.—Monardella exilis is very closely related to M. candicans. There are reasons for regarding it as a variety of M. candicans, as Asa Gray so disposed it. The differences are chiefly of degree, the amount of whiteness of the bracts and of the calyx-teeth. The heads are, however, smaller in M. exilis; they are, moreover, naked and borne on peduncles mostly 1 to 2¼ inches long, while the heads in M. candicans are commonly leafy-bracteate and not properly peduncled or scarcely so, since the uppermost pair of leaves usually subtends the heads rather closely. Otherwise Monardella exilis has, markedly, the same type of organs as M. candicans.

Locs.—Southern Sierra Nevada: Walker Pass, *Purpus* 5347; Kernville, *T. Brandegee;* Weldon, South Fork Kern River, *Voegelin* 73. Western Mohave Desert: Mohave sta., *Hall & Chandler* 783; Lancaster, *Duran* 3415; Little Rock Creek, n. slope San Gabriel Mts., *Peirson* 2416; Hesperia, *Parish* 2450; Deep Creek, n. slope San Bernardino Mts., *Wheeler* 1972; Rabbit Sprs., *Hall & Chandler* 6772.

Refs.—MONARDELLA EXILIS Greene, Pitt. 5:86 (1902). *Monardella candicans* Benth. var. *exilis* Gray, Syn. Fl. ed. 2, 2:358 (1886), type loc. "S. E. Cal. or adjacent Arizona," *Palmer*, more precisely headwaters of the Mohave River, as evidenced by Palmer's herb. label 364; Jepson, Man. 884 (1925). *Madronella exilis* Greene, Lflts. 1:169 (1906).

18. **M. leucocephala** Gray. Stems branching, 4 to 10 inches high; herbage pubescent; leaf-blades oblong- to ovate-lanceolate, entire, 6 to 8 lines long, short-petioled; heads many, small, terminal or axillary; bracts ovate to orbicular, shortly acute, thin, white-scarious, the nerves hirsutulous; tips of calyx-teeth white, subulate, recurved in age, hirsutulous; corolla white.

Dry sandy plains or depressions, 200 to 250 feet: east side of the San Joaquin Valley near Merced and along the Tuolumne River. May-June.

Note on endemism.—Monardella leucocephala, almost unique in the genus, is a singular species limited to two narrow neighboring localities on the San Joaquin plains in Stanislaus and Merced counties. It was first discovered "near Merced" by Bolander in 1866. Later, in 1878, it was again collected by A. E. Bush, also near Merced. Possibly both these collections were obtained in one restricted area on the sandy plain where the colony was subsequently destroyed by cultivation, since the species is not known today in that district. Twenty-three miles north it borders the Tuolumne River in a strip about 15 miles long. Three stations may be noted here: near Basso Bridge, *Jepson* 50e in 1896 (abundant in sandy grain fields in rolling country); Waterford, 9 mi. e., *Hoover* 1232, in 1936, and 12 mi. e., *Hoover* 693, in 1935. Specimens are a rarity in herbaria. Carl Epling, the monographer of Monardella, writes on the sheet of *Jepson* 50e the following note: "Nihil hoc posse mihi esse jucundius."

Refs.—MONARDELLA LEUCOCEPHALA Gray, Proc. Am. Acad. 7:385 (1868), type loc. Merced plains, *Bolander* ("4845. Near Merced. Sandy soil"); Jepson, Fl. W. Mid. Cal. 464 (1901), ed. 2, 363 (1911), Man. 884 (1925). *Madronella leucocephala* Greene, Lflts. 1:169 (1906).

22. LYCOPUS L. WATER HOARHOUND

Perennial herbs similar to Mentha, but bitter and much less aromatic. Stems erect, arising from rootstocks. Flowers very small, white or whitish, in sessile densely capitate glomerules, apparently whorled. Calyx campanulate, 4 or 5-toothed. Corolla-tube (in ours) filled with horizontally spreading hairs which close the tube as with a fine mesh; upper lobe of corolla entire, the lower 3-lobed. Fertile stamens 2, the upper pair without anthers, the tips of the filaments in ours thickened. Nutlets with thickened margins.—Species 10, all continents except South America. (Greek lukos, wolf, and pous, foot, perhaps on account of the shape of the leaves in the original species.)

Stems arising from non-tuberous rootstocks; calyx-teeth longer than nutlets.
  Leaf-blades with uneven or salient teeth or incisely lobed; nutlets ½ line long, with thick entire margin............1. *L. americanus.*
  Leaf-blades evenly serrate; nutlets ¾ line long, with thin undulate margin..........2. *L. lucidus.*
Stems arising from tuberous rootstocks; calyx-teeth about as long as nutlets............3. *L. uniflorus.*

1. **L. americanus** Muhl. GIPSY HOARHOUND. (Fig. 444.) Stem branching above, 2 to 4 feet high; herbage nearly glabrous; leaf-blades broadly or narrowly lanceolate, incisely toothed or laciniate-pinnatifid (the upper with few scattered teeth), 1 to 2 inches long, narrowed at the cuneate base into a short petiole; calyx-teeth narrowly ovate, acuminate; inner angle of nutlets granulose at apex.

Swamps or river bottoms, 10 to 1500 feet: Los Angeles and San Bernardino Cos.; lower San Joaquin Valley; Sacramento Valley; northern Humboldt Co. North to British Columbia, east to Newfoundland. Aug.-Sept.

Locs.—San Bernardino Valley, *Parish* 11,636; Santa Ana River bottom, e. of Anaheim, *Howell* 3120; Ballona, Los Angeles Co., *Braunton* 688; Mountain Lake, San Francisco (Zoe 2:368); Old River, 4 mi. ne. of Byron, *Jepson* 10,028; Tyler Isl., lower Sacramento River, *Jepson* 14,900; Marysville, *Jepson* 16,756; Oroville, *Jepson* 19,460; Klamath River at mouth of Bluff Creek, Humboldt Co., *Tracy* 6853.

Refs.—LYCOPUS AMERICANUS Muhl.; Bart., Fl. Phila. 15 (1815), type loc. Philadelphia, Pa.; Jepson, Fl. W. Mid. Cal. 466 (1901), ed. 2, 364 (1911), Man. 885, fig. 830 (1925). *L. sinuatus* Ell., Bot. S. Car. and Ga. 1:26 (1821), type loc. Ogeechee River, Ga. *L. lacerus* Greene, Pitt. 3:339 (1898), type loc. Elk Grove, Sacramento Co., *Drew.*

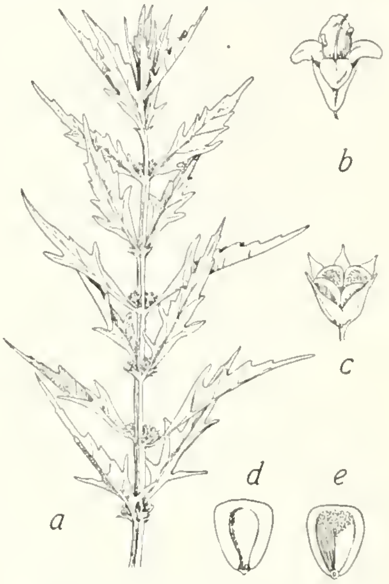

Fig. 444. LYCOPUS AMERICANUS Muhl. *a*, fl. stem, × ½; *b*, fl., × 2½; *c*, fruit and calyx, × 10; *d*, nutlet, dorsal view, × 14; *e*, nutlet, ventral view, × 14.

2. **L. lucidus** Turcz. BENICIA HOARHOUND. Stem stoutish, 2 to 3 feet high; herbage puberulent; leaf-blades broadly or narrowly oblong, coarsely but evenly toothed, sessile, the lower 3 to 4 inches long and ¾ inch wide, the upper reduced; calyx-teeth attenuate-subulate; inner angle of nutlets granulose to the base.

Salt marshes and freshwater swamps, 10 to 1000 feet: Solano Co.; Shasta Co. North to Washington, east to Michigan. Northern Asia. Aug.-Sept.

Locs.—Benicia, Solano Co., *Jepson* 14,901; Fall River Lake, Shasta Co., *M. S. Baker.*

Refs.—LYCOPUS LUCIDUS Turcz.; Benth., in DC., Prodr. 12:178 (1848), type loc. Ircutia, Siberia; Jepson, Fl. W. Mid. Cal. 466 (1901), ed. 2, 364 (1911), Man. 885 (1925); Piper, Contrib. U. S. Nat. Herb. 11:491 (1906). *L. maritimus* Greene, Pitt. 3:340 (1898), type loc. Suisun Marshes, *Greene.*

3. **L. uniflorus** Michx. Stem erect, 6 to 12 inches high, arising from a tuberous rootstock, simple or with 2 or 3 branches from or near the base, microscopically puberulent; leaf-blades oblong-ovate to ovate, serrate above the cuneate base, 1 to 1½ (or 2½) inches long, borne on petioles ½ to 2 lines long; calyx-teeth ovate; nutlets ½ line long, the flat back with a thickened entire margin.

In boggy ground or borders of ponds, 5 to 20 feet: northern Humboldt coast. North to Oregon, thence to British Columbia, Newfoundland and North Carolina. June-July.

Locs.—Dry Lagoon (near Stone Lagoon), *Tracy* 13,513; Big Lagoon, *Tracy* 7284. First records for California.

Ref.—Lycopus uniflorus Michx., Fl. 1:14 (1803), type loc. region of lakes St. John and Mistassini, Quebec, Can.

23. MENTHA L. Mint

Very odorous perennial herbs, mostly with slender creeping rootstocks, usually tomentose or hairy and with rather small flowers in whorls, which are either remote or spicate or capitate. Calyx campanulate or short-tubular, commonly 5-toothed, nearly regular, or 2-lipped. Corolla with a short tube; upper lip emarginate or entire, scarcely or not at all larger than the lobes of the lower lip. Stamens 4, erect and nearly equal. Nutlets smooth.—Species 20, all continents except South America. (Ancient Greek name.)

Flower-whorls remote or distant, borne in the leaf axils; corolla puberulent or hairy.
  Stems leafy to the top, the leaves subtending the flower-whorls more or less petioled, spreading widely and much exceeding the flowers; calyx-teeth triangular, similar and equal or nearly so........1. *M. arvensis.*
  Stems with the upper leaves subtending the flower-whorls reduced and bract-like, turned downward, sessile or subsessile; calyx-teeth dissimilar, the 3 upper triangular-acuminate, the 2 lower lanceolate-subulate........2. *M. pulegium.*
Flower-whorls approximate, in terminal leafless spikes or the lowermost in the upper leaf axils; corolla glabrous.
  Leaves petioled; spikes 5 to 9 lines wide.
    Leaf-blades ovate, mostly very acute, obtuse at base, much longer than broad; spikes 5 to 6 lines wide........3. *M. piperita.*
    Leaf-blades broadly ovate, less acute, truncatish at base, sometimes nearly as broad as long; spikes 8 to 9 lines wide........4. *M. citrata.*
  Leaves sessile or nearly so; spikes slender (3 lines wide), mostly interrupted......5. *M. spicata.*

1. **M. arvensis** L. var. **canadensis** Briq. Field Mint. Tule Mint. (Fig. 445.) Stems simple or much branched, erect, 1 to 4 feet high, leafy to the top; herbage puberulent or sometimes partly glabrous; leaf-blades ovate to oblong-lanceolate, sharply serrate, 1 to $2\frac{3}{4}$ inches long, shortly petioled; flower whorls 5 to 15 (or 25), very much shorter than the leaves (even the uppermost), sometimes shorter than the petioles; calyx pubescent, its ciliate teeth triangular, acuminate, $\frac{1}{4}$ to $\frac{1}{3}$ as long as the tube; corolla dull white, lavender, purplish or pinkish, glabrous or subglabrous; stamens well-exserted.

River lowlands, coastal marshes and montane meadows, 10 to 7500 feet, common: Laguna, San Jacinto and San Bernardino mountains of Southern California; North Coast Ranges from Sonoma Co. to Humboldt Co.; lower San Joaquin Valley; Sacramento Valley; Sierra Nevada from Tulare Co. to Siskiyou and Modoc Cos.; east side of Sierra Nevada from Inyo Co. to Modoc Co. East to Connecticut, north to Canada. July-Oct.

Locs.—San Diego Co.: Witch Creek, *Alderson;* Ramona, *K. Brandegee.* Coast Ranges: Alexander Valley, ne. Sonoma Co., *Jepson* 9485; Mad River near Arcata, *Jepson* 17,936. Great Valley: Rough & Ready Isl., San Joaquin Co., *Berg;* Sherman Isl., San Joaquin Co., *Jepson* 10,216; Suisun Marshes, *Jepson* 14,918; Ryer Isl., lower Sacramento River, *Jepson* 14,919; Putah Creek near Winters, *Jepson* 14,916; Sacramento, *Michener & Bioletti.*

In the high mountains of Southern California and in the Sierra Nevada occur forms with glabrous or subglabrous leaves as follows: Var. glabrata Fer., flower whorls few (mostly 4 to 6), the upper leaves subsessile.—Noble Mine, San Diego Co., *Chandler* 5494; Bluff Lake, San Bernardino Mts., *R. D. Williams;* Kern River, Tulare Co., *Culbertson* 4283; Truckee, *Sonne* 7107; Jess Valley, Warner Mts., *L. S. Smith* 1062; Yreka, *Butler* 170. In the same high montane region occur also glabrous forms (a) with many flower-whorls and uppermost leaves petioled.—Markwood Mdw., Fresno Co., *Jepson* 16,052; Mono Hot Sprs., South Fork San Joaquin River, *A. L. Grant* 1485; Long Valley, Lassen Co., *Jepson* 7784; Mineral, Tehama Co., *J. Grinnell;* Sisson, Siskiyou Co., *Jepson* 14,917. Also glabrous forms (b) with few flower-whorls and markedly petioled leaves.—Jess Valley, Warner Range, Modoc Co., *Jepson* 7944. Also glabrous forms (c) with many flower-whorls and uppermost leaves subsessile.—Hetch-Hetchy, *A. L. Grant* 880; Dana, ne. Shasta Co., *Jepson* 5757. There is, therefore, no definite segregation of structural characters separating a var. glabrata as including all or any major part of the Sierran forms, nor is there any geographic segregation. In pubescence, length of petiole and number of whorls the various forms pass by small gradations into each other.

Var. **lanata** Piper. Upper part of stem and leaves (especially the lower surface) permanently lanate or villous; flowers invested in wool when young, shaggy-villous at maturity.—Mostly near the coast, 10 to 1500 feet: Los Angeles River, *Braunton* 598; Santa Barbara (Bull. Torr. Club 29:223); Laguna, San Luis Obispo Co., *Unangst;* West Berkeley, *Greene;* Dry Lagoon (near Stone Lagoon), Humboldt coast, *Tracy* 13,501. North to Washington.

Refs.—MENTHA ARVENSIS L. var. CANADENSIS Briq.; Engler & Prantl, Nat. Pflzfam. 4^3:319 (1895). *M. canadensis* L., Sp. Pl. 577 (1753), type from Canada, *Kalm* (cf. Epling, Jour. Bot. 67:8); Jepson, Fl. W. Mid. Cal. 466 (1901), ed. 2, 365 (1911). *M. arvensis* Jepson, Man. 885, fig. 831 (1925). Var. GLABRATA Fer., Rhod. 10:86 (1908). *M. canadensis* var. *glabrata* Benth., Lab. Gen. et Sp. 181 (1833), resting on M. borealis Michx., Fl. Bor. Am. 2:2 (1803), type loc. "juxta amnes ad sinuum Hudsoniis defluentes." *Hedeoma purpurea* Kell., Proc. Cal. Acad. 5:52 (1875), type loc. Webb's Ldg., Bouldin Isl., San Joaquin River, *Kellogg*, belongs here acc. *K. Brandegee*, Zoe 4:215. *Micromeria purpurea* Gray, Bot. Cal. 1:595 (1876). *Satureia purpurea* Briq. in Engler & Prantl, Nat. Pflzfam. 4^{3a}:300 (1896). Var. LANATA Piper, Bull. Torr. Club 29:223 (1902), type loc. Parrotts, Lincoln Co., Wash., *Lake & Hull* 603. *M. lanata* Rydb., Bull. Torr. Club 36:687 (1909).

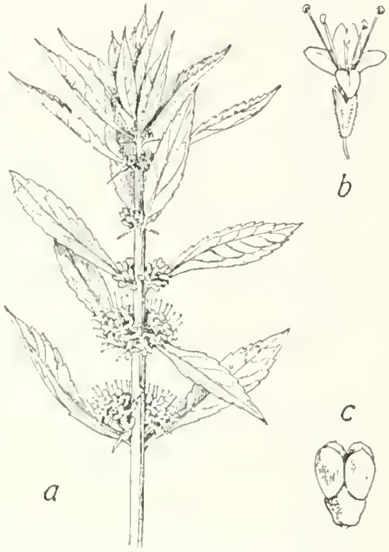

Fig. 445. MENTHA ARVENSIS L. var. CANADENSIS Briq. *a*, fl. branchlet, × ½; *b*, fl., × 2½; *c*, nutlets, × 7½.

2. **M. pulegium** L. PENNYROYAL. Stems prostrate and rooting at the joints or decumbent, 1 to 2 feet long; herbage pubescent; leaf-blades elliptic- to oblong-ovate, serrate or entire, 4 to 8 lines long, shortly petioled or subsessile; flower-whorls discrete, on the terminal branches, the subtending leaves reduced or bract-like and orbicular to broadly obovate, sessile or subsessile, shorter than or slightly exceeding the flower whorls; 3 upper calyx-teeth triangular, acuminate, the 2 lower lanceolate-subulate, all ciliate-bristly, the throat with a ring of hairs; corolla lavender, nearly twice as long as the calyx, minutely puberulent, its lobes with a long thin or dense tuft of hairs on back at apex.

Sloughs, marshes, moist flats and ditches, 10 to 2600 feet: Humboldt Co. to Monterey Co.; lower San Joaquin River; Madera Co.; San Diego Co. Naturalized from Europe. July-Oct.

Note on immigration.—Mentha pulegium, a European immigrant, was discovered on Bouldin Island, lower San Joaquin River, by Albert Kellogg in 1875 or earlier, at Stockton in 1888 by H. P. Fitch and at Santa Rosa by E. L. Greene in the same year. It has since migrated widely in our territory. From 1925 to 1936 it has become common and is spreading rapidly in the Redwood belt of the North Coast Ranges. Various stations throughout California are cited as follows: Orick, nw. Humboldt Co., *Tracy* 15,078; Phillipsville, South Fork Eel River, Humboldt Co., *Jepson* 17,872; Briceland, s. Humboldt Co., *Tracy* 6336 (a range weed, taking possession of the most fertile and moist parts of the grassy hills and thus crowding out valuable forage.—J. P. Tracy); Dimmick Park, sw. Mendocino Co., *Jepson* 17,674; Monte Rio, Russian River, *Jepson* 2363; Watson School, Bodega, *Jepson* 15,938; Manzanita sta., Marin Co. *Jepson* 10,657; Palo Alto, *Congdon;* betw. Castroville and Salinas, *J. B. Hickman;* North Fork sta., Madera Co., *Jepson* 16,002; Mesa Grande, San Diego Co. (Bull. S. Cal. Acad. 24:50).

Refs.—MENTHA PULEGIUM L., Sp. Pl. 577 (1753) type European; Jepson, Fl. W. Mid. Cal. 466 (1901), ed. 2, 365 (1911), Man. 885 (1925).

3. **M. piperita** L. PEPPERMINT. Plants commonly lush with numerous sterile stems in clumps 2 to 5 feet high; stems erect, commonly strict and unbranched below the terminal inflorescence; herbage glabrous; leaf-blades ovate-oblong to oblong-lanceolate, acute, sparsely and sharply serrate, mostly obtuse at base, ¾ to 1¾ inches long, shortly but distinctly petioled; spikes dense, scarcely inter-

rupted, ¾ to 3¾ inches long, 5 to 6 lines broad; calyx resinous-glandular, the lower teeth subulate, the upper ones broadly subulate; corolla white with a pink tinge or purple, 2 to 3 lines long; lobes of lower lip spreading, oblong, obtuse, similar to the emarginate upper lip; sinus of upper lip shallow, ¼ length of the lip.

Wet ground of creek beds and valley streams, 10 to 700 feet: naturalized at scattered localities throughout the state. Native of Europe. July-Nov.

Locs.—West Berkeley, *Jepson* 14,928; Haywards, *Tidestrom;* Alviso, Santa Clara Co., *C. F. Baker* 1851; Mormon Creek, Tuolumne Co., *Williamson* 334; San Luis Obispo, *Condit;* Sherman, Los Angeles Co. (Bull. S. Cal. Acad. 19^4:23); San Bernardino (Zoe 2:28); Santa Ana, Orange Co. (Abrams, Fl. Los Ang. 348,—1904).

Refs.—MENTHA PIPERITA L., Sp. Pl. 576 (1753), type from England; Jepson, Fl. W. Mid. Cal. 467 (1901), ed. 2, 365 (1911), Man. 886 (1925).

4. **M. citrata** Ehrh. BERGAMOT MINT. Stems producing leafy stolons at base, 1 to 2 feet high; herbage glabrous; spikes ½ to 1¾ inches long, 8 to 9 lines wide, oblong and much interrupted, or reduced to a single subglobular cluster; leaf-blades broadly ovate, serrate, truncatish or obscurely subcordate at base, 1 to 2½ inches long, often as broad as long, the lateral nerves usually very prominent; calyx resinous-glandular; corolla rose-purple, 3 to 4 lines long; sinus of upper lip deeper than in M. piperita, ⅓ the length of the lip.

Introduced from Europe along ditch banks and borders of ponds, 100 to 1000 feet: scattered stations, mostly near the coast. Sept.-Oct.

Locs.—Arcata bottom, Humboldt Co., *Tracy* 8388; Loleta Pond near Eureka, *Tracy;* West Berkeley (Man. Reg. S. F. Bay 287); Fresno, *C. E. Jenney* 70; San Bernardino, *Parish* 5362.

Refs.—MENTHA CITRATA Ehrh., Beitr. 7:150 (1792), type from Europe; Jepson, Fl. W. Mid. Cal. 467 (1901), Man. 886 (1925). *M. piperita* var. *citrata* Rouy, Flore de France 11:378 (1909).

5. **M. spicata** L. SPEARMINT. Stems rod-like, many in a stool, 3 to 5 feet high; herbage almost glabrous; leaf-blades broadly oblong to lanceolate, serrulate, 1 to 3 inches long, sessile or subsessile; spikes slender, 2 to 3 inches long, paniculately disposed above the foliage, the whorls many (10 to 20), commonly discrete below, usually merged above; calyx-teeth subulate or filiform, microscopically ciliate, nearly as long or longer than the tube; corolla white or pale.

Wet ground, often with tall grasses and sedges, of mostly lowland marshes and stream borders, 10 to 1000 (or 5000) feet: scattered localities throughout the state. Naturalized from Europe. July-Sept.

Locs.—Fort Bidwell, Modoc Co., *Manning* 395; Yreka, *Butler* 178; Trinity River Valley near the South Fork, *Tracy* 7233 in 1925; Penn Valley (w. of), Nevada Co., *Jepson* 16,761 in 1934; near Marble Creek, Eldorado Co., *H. M. Wheeler* in 1941; Scott Valley, Lake Co., *Jepson* 14,924 in 1892; Napa Valley, *Jepson* 14,927 in 1892; Berkeley, *Jepson* 14, 923 in 1894; Alvarado, *Jepson* 14,926 in 1897; Old Auberry, Fresno Co., *Jepson* 13,297 in 1928; Echo Park, Los Angeles, *Braunton* 667; San Bernardino, c. 1890 (Zoe 1:124).

Refs.—MENTHA SPICATA L., Sp. Pl. 576 (1753), type from Denmark; Jepson, Fl. W. Mid. Cal. 467 (1901), ed. 2, 365 (1911), Man. 886 (1925). *M. viridis* L., Sp. Pl. ed. 2, 804 (1763), type European.

MENTHA ROTUNDIFOLIA Hudson, Fl. Angl. 221 (1762); Jepson, Man. 886 (1925). *M. spicata* var. *rotundifolia* L., Sp. Pl. 576 (1753), type European. Apple Mint. Stems 4 to 6 feet high, villous; leaf-blades elliptic, rounded at base, serrulate, hirsutulose and sometimes a little tomentulose (often white-cobwebby beneath), ¾ to 2¼ inches long, sessile; spikes similar to M. spicata; calyx hairy-pubescent; corolla white, on the outside a little short-hairy with spreading hairs.—Adventive from Europe in river bottoms and valley flats, 50 to 500 feet: Phillipsville, Humboldt Co., *Jepson* 17,866 in 1936; Big Basin, Santa Cruz Mts., *F. F. Hesse* 143; Glendale (Dav. & Mox. Fl. S. Cal. 311); Los Angeles River, near Los Angeles, *Braunton* 597 in 1902; Waterman Creek, San Bernardino Mts. (Pl. World 20:252).

Hyssopus officinalis L., Sp. Pl. 569 (1753), type loc. uncertain; Gray, Syn. Fl. 2:354 (1878). HYSSOP. Perennial virgately branching herb about 1 foot high; leaves linear or lanceolate, entire; flowers blue-purple, in small spicate clusters.—Native of Europe and Asia; escaped from gardens in California (acc. Gray, l.c.); not seen by recent California botanists.

SOLANACEAE. Nightshade Family[1]

Herbs or shrubs with alternate leaves. Flowers complete and regular, borne solitary and terminal, or seeming as if axillary, or disposed in cymes or panicles or in clusters resembling umbels or racemes. Calyx 5-cleft or -toothed, usually persistent. Corolla 5-lobed, the lobes valvate or imbricate and mostly plicate in the bud. Stamens 5, inserted on the corolla and alternate with its divisions. Ovary superior, 2-celled, usually seated on a conspicuous hypogynous disk, the 2 carpels obliquely placed with reference to the median plane; style 1; stigma entire or sometimes 2-lobed. Fruit a berry or capsule. Seeds usually numerous, borne on thick axile placentae, the embryo embedded in endosperm.—The branching is sympodial and all flowers are actually terminal and solitary, or borne in cymes. The cymes may be simple, or become umbel-like in form, or compound. When a growing axillary shoot thrusts the terminal flower to one side and takes up a terminal position and is in turn thrust aside by the next axillary shoot, and so on, then in such a case the cyme becomes one-sided and raceme-like and is bracted or frequently bractless. A panicle in this family is often composed of such false racemes or of clusters of 1 to 4-flowered cymes scattered along its branches. The bracts are adnate to the growing axillary branches and carried up a distance on them. It is for such a reason that the upper leaves in Petunia are opposite. The seeds are generally reniform. Datura has a falsely 4-celled capsule. The basis for the primary division in the genus key is after R. von Wettstein (cf. Engler & Prantl, Nat. Pflzfam. 4^{3b}:10). Distinguished on the whole by its poisonous or acrid properties, this family includes such cultivated plants as Chilies, Cayenne Pepper, Tomato, Potato, Ground Cherry, Bitter-sweet, Belladonna and Petunia.—Genera about 66, species about 1500, all continents.

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Uncertain geographic records.—Many early records list various species as Californian through geographic error, often assisted by erroneous determination. Species which indisputably occur just beyond our boundaries are often also listed as Californian without specific supporting facts. Plant collections made in the region of the lower Colorado River in early days were, as to field origin, often incorrectly or indefinitely labeled at a time when state boundaries were not clearly known. These considerations involve various families and especially certain species of the Solanaceae. Physalis cinerascens Hitchc., Physalis lobata Torr., Physalis viscosa L., Physalis muriculata Greene, Solanum interius Rydb., Chamaesaracha conioides Britt. and Chamaesaracha coronopus Gray are set down as of "California" by P. A. Rydberg (North American species of Physalis and related genera) or by Wooton and Standley, Flora of New Mexico. Rydberg attributes (Mem. Torr. Club 4:331) the type collection (*Buckminster*) of Chamaesaracha physaloides Greene to California when it should be Arizona. In these instances, and in many other instances in other families where species have been attributed to "California" in publications originating in the eastern United States (species not known as Californian in California), inquiry at source by this author has failed in every case to elicit confirmation of such a statement in terms of a specific station, collector and collector's number. If, however, the "California" of such publications were validated by citation of a definite station with the usual evidence accompanying such a citation it would obviously furnish a readier means for determining clearly the occurrence of suspected species in our area.

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[1] The manuscript of Solanaceae has been read and critical notes and analyses of Nicotiana supplied by Helen-Mar Wheeler, an investigator penetrating in observation, sound in experiment and discerning in judgment, who as Research Associate is a member of the staff long engaged with "Investigations on the genus Nicotiana" in the Department of Botany, University of California.

Embryo straight or slightly curved, the curve less than a semicircle; corolla tubular or funnelform; fruit a 2-celled capsule.
  Flowers in panicles or racemes; herbs (in ours) or one species a shrub.................1. NICOTIANA.
  Flowers not in panicles or racemes; herbs.
    Flowers in axillary umbels; seeds flattened...2. ORYCTES.
    Flowers solitary in the axils; seeds not flattened..3. PETUNIA.
Embryo clearly curved, the curve forming more than a half-circle.
  Ovary 4-celled; corolla very large (2 to 9 inches long); capsule spiny; herbs..........4. DATURA.
  Ovary 2-celled; fruit a berry.
    Corolla funnelform; spiny shrubs...5. LYCIUM.
    Corolla rotate; herbs, or some species in no. 6 woody at base.
      Anthers connivent, longer than the filaments; calyx remaining small......6. SOLANUM.
      Anthers not connivent, mostly shorter than the filaments.
        Calyx herbaceous, not inflated, closely investing the berry..7. CHAMAESARACHA.
        Calyx in fruit becoming large and bladdery, and loosely enclosing the berry........ 8. PHYSALIS.

1. **NICOTIANA** L. TOBACCO

Heavy-scented usually viscid-pubescent herbs or shrubs with entire leaves. Flowers in panicles or racemes. Calyx persistent, more or less investing the fruit, 5-toothed or -lobed. Corolla funnelform or salverform, its (proper) tube in ours short, the throat long. Stamens inserted at summit of corolla-tube or in the throat, usually 4 long and 1 short, mostly included. Fruit a smooth capsule, septicidal, the valves promptly 2-cleft at apex, thus seeming as if 4-valved. Seeds small, numerous.—Species about 50, chiefly North and South America, some in Australia, a few endemic in islands of the Pacific Ocean. (Jean Nicot, French diplomat and author of the most ancient dictionary in the French language, but more celebrated as having introduced tobacco into France from Portugal.)

Note on aboriginal uses.—On the Hupa Expedition in 1902, this author, in company with the anthropologist, Pliny E. Goddard, first saw cultural colonies of Nicotiana bigelovii on the lands of the Hupa tribe. It was, in primitive times, their only agricultural practice. Their neighbors southward, the Pomos, also used the leaves for smoking but apparently never cultivated the plant. Probably Nicotiana bigelovii, throughout its range in California, was everywhere used by the various native tribes as a smoking tobacco. Nicotiana attenuata was likewise gathered by the Indian tribes living within its range for smoking or chewing or other uses. The northern Paiute Indians in Modoc County (the Paviotso) smoked this tobacco in stone pipes, says Isabel Kelly who adds: "The leaves were gathered, dried, pounded and stored in sacks (presumably buckskin). A little deer fat was added to improve the flavor." In the South Fork Valley, Kern County, near Weldon, both Nicotiana attenuata and Nicotiana bigelovii are still gathered by the women of the Tübatulabal tribe (Erminie W. Voegelin, Anthropological Records, vol. 2, no. 1). "Tobacco and lime chewed, drunk, snuffed, eaten by men and women, and also used as offering" (p. 37). Kernels of the Digger Pine nuts (Pinus sabiniana) were mixed with tobacco "because they gave a better flavor" (p. 11). In Southern California the Coahuilla Indians smoked Nicotiana attenuata; it was also "pounded up in small mortars especially kept for this purpose, mixed with water and chewed" (David P. Barrows, Ethno-Botany of the Coahuilla Indians, 75).

At Santa Barbara in 1875 J. T. Rothrock unearthed stone pipes in Indian mounds and also found Nicotiana clevelandii growing on the mounds (Bot. Wheeler, 48). He makes the inference that in all probability this species of Nicotiana was used as a smoking tobacco by the Indians of the district (that is the Barbarenos).

For further reference to the literature of indigenous species of smoking and chewing tobaccos in California see E. W. Voegelin, l.c. 38, 81.

Shrub; corolla yellow; herbage glabrous..1. *N. glauca.*
Herbs; corolla white to greenish or greenish-yellow; herbage viscid.
  Leaf-blades (except the lowermost) auricled at the sessile base; flowers open during the day; perennial; transmontane deserts...2. *N. trigonophylla.*

Leaf-blades petioled or if sessile not auricled or subcordate at base (except rarely in no. 6); flowers open in the evening and all night, closed most of the day; annuals.

  Cauline leaves petioled; corolla-limb 5 to 10 lines broad, its lobes short and broad, roundish or quadratish, obtuse or subacute, the sinuses narrow; stamens equally inserted at summit of corolla-tube.

    Calyx with 5 dark longitudinal stripes, its lobes becoming linear, equaling or exceeding the tube; corolla 6 to 10 lines broad; cauline leaves with greatest breadth usually near base; cent. and n. Cal............................3. *N. acuminata.*

    Calyx not obviously striped, its lobes acute, shorter than the tube; corolla 3 to 6 lines broad; cauline leaves with greatest breadth usually above base or near middle; mostly transmontane..4. *N. attenuata.*

  Cauline leaves sessile or subsessile, rarely some (usually the lower) petioled.

    Corolla-limb 3 to 5 lines broad, shallowly parted into ovate lobes with narrow sinuses; stamens equally inserted at summit of corolla-tube; calyx-lobes very unequal, the longer once to twice length of the tube; coastal S. Cal. and Colorado Desert...5. *N. clevelandii.*

    Corolla-limb ¾ to 2 inches broad, deeply parted into ovate-acute lobes with broad sinuses and thus stellate in appearance; stamens unequally inserted high in corolla-throat; calyx-lobes little unequal; cismontane Cal.........................6. *N. bigelovii.*

1. **N. glauca** Graham. MEXICAN TOBACCO. Soft-woody evergreen shrub, 6 to 15 feet high, very slender and loosely branching, with glabrous and glaucous herbage; leaf-blades ovate, 1½ to 8 inches long, on petioles ⅓ to ⅔ as long; flowers in terminal panicles; calyx unequally 5-toothed, 5 to 6 lines long; corolla 1½ inches long, its tube dilated into the throat above summit of the calyx (the stamens inserted at this point), its limb 3 to 4 lines broad, shallowly 5 (occasionally 4) -lobed, the throat of corolla constricted just below the limb; capsule oblong, ½ inch long.

Native of Argentina, abundantly naturalized along the banks and beds of living and of seasonal water courses, especially along stream beds of the "wash" type, 5 to 3000 feet: nearly throughout California in the warmer drier regions. Apr.-Nov.

Immigration note.—According to S. B. Parish (Bull. S. Cal. Acad. 19^4:24), Nicotiana glauca was introduced into Southern California from Mexico during the mission period. This introduction was undoubtedly for use as a garden shrub, since Mexican immigrants continued to carry it with them when migrating northward. J. B. Davy found it in the Mexican Camp at New Almaden in Santa Clara County in 1898. The author's field book records it as planted by Mexicans in the fenced enclosure of a shack on the open plain at Ludlow in the Mohave Desert as lately as 1913. Since its early introduction it has run wild as an escape and has been spreading slowly but steadily northward throughout the entire state at low altitudes, save perhaps on the east side of the Sierra Nevada and in the North Coast Ranges north of Napa County. It was not, however, listed in any flora until 1894 (cf. Greene, Man. Reg. S. F. Bay, 268). The author first observed it as plentiful along Putah Creek near Winters, Yolo County, on September 17, 1887, and collected it on Ulatis Creek, at Vacaville, Solano County, Sept. 22, 1887. Other early records are: Stockton, *H. P. Fitch* 137 in 1888; Knights Ferry, *Sanford* 171 in 1890; Clear Creek, Butte Co., *H. E. Brown* in 1896; San Leandro, Alameda Co., *Davy* in 1898. It is now found along a large number of foothill streams or washes or gulches around the west margins of the Great Valley where it often forms distinct groves or miniature forests on river flats or in sandy washes. Up to 1907 it was not known on the eastern side of the Great Valley but has since appeared at Oroville, at Hornitos (Mariposa Co.) and in the foothills (Kern River Cañon) northeast of Bakersfield. It is frequent in the South Coast Ranges and in coastal Southern California and occurs abundantly along the coast line from Monterey Co. to San Diego Co.: Little Sur River, *Jepson;* Gaviota Pass, Santa Inez Mts., *A. L. Grant* 1750; near Newport Beach, *L. M. Booth* 1338; Santiago Creek, Santa Ana Mts., *Alice King;* Oceanside, San Diego Co., *Jepson.* By 1908, the writer observed, it was beginning to fill the deep cañons of Santa Catalina Island. By 1920, C. F. Millspaugh reported (cf. Jepson Field Book 36:184), it had gained the tops of the Santa Catalina ridges. It is also found in the Colorado Desert and western Mohave Desert. Occasionally cattle are poisoned by its herbage. The first leaves are in appearance somewhat cabbage-like.

Refs.—NICOTIANA GLAUCA Graham, Edin. New Phil. Jour. 5:175 (1828), cult. in the Royal Botanic Gardens, Edinburgh, the seed from Buenos Aires, Argentina; Jepson, Fl. W. Mid. Cal. 391 (1901), ed. 2, 366 (1911), Man. 888 (1925).

2. **N. trigonophylla** Dunal. DESERT TOBACCO. Stems slender, 1 or several to many from the base, erect, 1 to 3 feet high; leaf-blades broadly oblong to ovate, entire, acute, sessile and auricled, 2 to 5 inches long, the lower ones attenuate at base into a shortly winged petiole; flowers in nearly naked raceme-like inflorescences

(monochasial cymes), the bracts (except the lower) mostly small; calyx cleft nearly half way into lanceolate lobes, about half as long as the corolla; corolla greenish-white or greenish-yellow, 8 to 11 lines long, constricted just beneath the spreading limb, the limb at first slightly cupped or finally somewhat reflexed, 3½ to 6 lines broad; filaments hairy at very base, inserted at summit of corolla-tube.

Cañon walls, rocky outcrops on mesas and in washes, 5 to 4000 feet: Mono and Inyo Cos.; Mohave and Colorado deserts. East to Texas, south to Mexico. Apr.

Note on duration.—The stems arise each season from the markedly woody root-crown of a perennial taproot. Often the slightly suffrutescent bases of the stems live over a few winters. In all the deserts this author has found Nicotiana trigonophylla perennial. However, in the botanic garden at Berkeley it is, acc. Helen-Mar Wheeler, generally annual under cultivation. Over most of Arizona it is, too, annual but sometimes perennial in the southwestern part of the state (acc. Kearney & Peebles).

Locs.—Mono Co.: Painted Cañon, *Curtis Ferris* 67. Inyo Co.: Texas Spr., Funeral Mts., *Jepson* 6884; Johnson Cañon, Panamint Range, *Jepson* 19,625. Mohave Desert: Granite Mts. (near Avawatz Mts.), *Jepson* 17,285; Paradise Mts. (4½ mi. ne.), *Jepson* 20,334; Willow Spr. (cove below), Old Dad Mts., *Jepson* 20,424; Ord Mt., *Jepson* 5853; Needles (10 mi. w.), *Newlon* 543. Colorado Desert: Chuckwalla Wash, e. Riverside Co., *Schellenger* 91; Painted Cañon, Mecca Hills, *Jepson* 11,651; Palm Cañon of Mt. San Jacinto, *Jepson* 1409; San Felipe Wash, e. San Diego Co., *C. V. Meyer* 75; Vallecito, e. San Diego Co., *Jepson* 8627; Mountain Springs grade, w. Imperial Co., *Newlon* 375; Milpitas, Colorado River, *Jepson* 5284.

Most of the California collections of Nicotiana trigonophylla approach N. palmeri Gray (Syn. Fl. 2:242,—1878, type loc. Williams Fork, n. Ariz., *Palmer* 433) which is reduced to N. trigonophylla var. palmeri by Jones (Contrib. W. Bot. 12:52,—1908). Plants of typical N. palmeri are more robust than N. trigonophylla, appear to be of slower growth and lower, the inflorescence tends to be shorter and more leafy, while the corolla is not only larger but whiter, the limb well-spread and distinctly lobed.—Helen-Mar Wheeler.

Refs.—NICOTIANA TRIGONOPHYLLA Dunal in DC., Prodr. 13: 562 (1852), type loc. Aguas Calientes, Mex., *Hartweg;* Jepson, Man. 888 (1925).

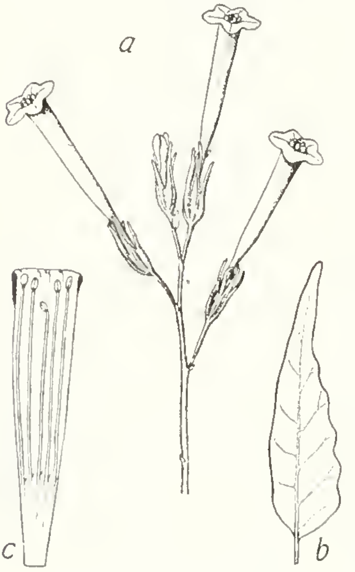

Fig. 446. NICOTIANA ACUMINATA Hook. var. MULTIFLORA Reiche. *a*, fl. branchlet, × ⅔; *b*, leaf, × ½; *c*, long. sect. of corolla-tube and -throat, × 1.

3. **N. acuminata** Hook. var. **multiflora** Reiche. (Fig. 446.) Stem erect, branching, rather coarser than in N. attenuata, commonly 1½ to 5 feet high; herbage strongly glandular-pubescent, ill-smelling; leaf-blades ovate to narrowly ovate-lanceolate, acute or acuminate, 2 to 10 inches long, obtuse, truncatish or subcordate at base; branches of the panicle elongated, spreading, loosely racemose; calyx-tube with 5 narrow longitudinal dark bands opposite to and extended up the lobes; calyx-lobes linear or subfiliform, equaling or exceeding the tube; corolla 1¾ to 2 inches long, the throat tubular with spreading limb 6 to 10 lines wide, the tube proper strongly narrowed below the calyx-teeth; stamens inserted at summit of the corolla-tube proper.

Introduced from South America and naturalized in valley flats and creek "bottoms," 50 to 500 (or 4500) feet: scattered stations in central and northern cismontane California. June-Oct.

This plant, Nicotiana acuminata var. multiflora, has been spontaneous as an alien immigrant in California for full fifty years, probably sixty years, perhaps longer. It has been misdetermined by botanists (including the author) as Nicotiana attenuata which it superficially resembles. The territory which it occupies in central California is quite distinct from the territory inhabited by Nicotiana attenuata. Investigating the genus Nicotiana generally and correcting a previous misdetermination of this species, W. A. Setchell was without any doubt the first botanist to redetermine plants of this alien in central California as belonging to the Nicotiana acuminata species group, probably about the year 1910, although there is no printed statement or herbarium record which furnishes precise confirmation. The species Nicotiana acuminata is discussed in Setchell's first paper on Nicotiana (Univ. Cal. Publ. Bot. 5:23,—1912), but no reference is made to its occurrence in California. Determinations of the following collections are all the results of critical work done by Helen-Mar Wheeler, who points out that Nicotiana acuminata is distinguishable from Nicotiana attenuata by the dark longitudinal stripes on the calyx, by its much longer corolla and by its longer looser more spreading panicle branches. The earliest available specimens show that this tobacco was spontaneous at Stockton as early as 1893 (*Davy* 409). Since Stockton is an ocean steamer port the seed may have come in ballast. The next year, 1894, it was collected in the Napa River "bottom" near St. Helena (*Jepson* 21,245). Other stations follow. Coast Ranges: Howell Mt., Napa Range, *Jepson* 18,449 in 1937; Agua Caliente, Sonoma Valley, *Jepson* 6191 in 1914; Livermore, *Hooper;* Gilroy, *Condit;* Panoche Valley, e. San Benito Co., *Quick* 1179 in 1934. Great Valley: Anderson, Shasta Co., *Blankinship* in 1911; Ripon, San Joaquin Co., *Hoover* 7029 in 1935; Waterford (12 mi. e.), Stanislaus Co., *Hoover* 2592 in 1937. Sierra Nevada: Riverton, Eldorado Co., *K. Brandegee* in 1914; O'Neals (5 mi. w.), Madera Co., *Biswell* 111 in 1935.

Refs.—NICOTIANA ACUMINATA Hook., Bot. Mag. t. 2919 (1829). *Petunia acuminata* Graham, Edin. New Phil. Jour. 5:378 (1828), type cult. in Royal Bot. Gard. Edinburgh, the seed from Mendoza, Argentina, *Gillies*. Var. MULTIFLORA Reiche, Flora de Chile 5:388 (1910). *N. multiflora* Phil., Linnaea 33:197 (1864), type loc. Choapa, Chile, *Landbeck*. *N. attenuata* Greene, Man. Bot. Reg. S. F. Bay, 268 (1894); Jepson, Fl. W. Mid. Cal. 391 (1901), ed. 2, 366 (1911), Man. 889 (1925), all in part as to text (the Man. fig. 833 is N. acuminata var. multiflora Reiche).

4. **N. attenuata** Torr. COYOTE TOBACCO. Stem simple or branching, 1 to 2 (or 4) feet high; herbage puberulent, only slightly or obscurely glandular; basal leaves in a flat rosette, the blades oval to elliptic-lanceolate, 2½ to 6 (or 9) inches long, the upper cauline varying to linear-lanceolate, 1 to 2½ inches long, all petioled; flowers many, as if racemose along the branches and thus disposed in a somewhat strict panicle; calyx-teeth lanceolate to subulate, ⅓ to as long as the tube; corolla 1 to 1½ inches long, with narrow limb 3 to 6 lines broad, its tube short, ¼ as long as throat; stamen filaments inserted at summit of corolla-tube; capsule commonly shorter than the calyx, sometimes longer.

Washes and valley flats, 2600 to 8600 feet: North Coast Ranges in Siskiyou, Humboldt and Trinity Cos.; north and east sides of the Sierra Nevada from eastern Siskiyou Co. to Inyo Co., on west slope from Fresno Co. to Kern Co.; Tehachapi Mts.; Mohave Desert; intramontane Southern California from Mt. Piños to the Laguna Mts. South to Lower California, east to New Mexico, Colorado and Wyoming, north to British Columbia. July-Nov.

Geog. note.—Nicotiana attenuata, basically a Great Basin plant, is in California almost wholly transmontane, or where it is intramontane the habitats are ecologically transmontane or essentially so. One marked exception emerges: the occurrence of stations in Trinity and Humboldt Cos., 100 to 2000 feet. These stations may, however, be considered as in harmony with the geographic mode of a number of Great Basin species whose pattern of distribution is extended as a narrow thrust into the northern part of the North Coast Ranges.

Locs.—North Coast Ranges: Oro Fino, w. Siskiyou Co., *Butler* 17; Burlington, South Fork Eel River, *Tracy* 4763; Hyampum, Trinity Co., *Chesnut & Drew*. Sierra Nevada (north and east sides): Little Shasta Valley, e. Siskiyou Co., *Jepson* 19,989; Surprise Valley, e. Modoc Co., *Manning;* Beckwith Pass, Lassen Co., *Jepson* 7760; East Carson River, Alpine Co., *Hall & Chandler* 4768; McGee Mdws., w. of Bishop, *K. Brandegee*. Southern Sierra Nevada (west slope): South Fork San Joaquin River, *Hall & Chandler* 7650; Trout Mdws., Tulare Co., *Jepson* 1044; Breckenridge Mt., Kern Co., *Bauer* 6. Tehachapi Mts.: Tehachapi, *Wolf* 1678. Mohave Desert: Tecopa Pass, Kingston Range, *Alexander & Kellogg* 2369; Warrens Well, *Howell* 2899. Intramontane S. Cal.: near Cuddy Valley, Mt. Piños, *Dudley & Lamb* 4510; Wheeler Hot Sprs., Ventura Co., *Munz* 13,231; Rock Creek, San Gabriel Mts., *Peirson* 495; Lake Arrowhead, San Bernardino Mts., *Braunton* 1048; Dutch Flat, San Jacinto Mts., *C. V. Meyer* 523a; Things Valley, near Campo, *Parish* 19,325.

Refs.—NICOTIANA ATTENUATA Torr.; Wats., Bot. King 276, pl. 27, figs. 1, 2 (1871), type loc. Carson City, Nev., *Anderson* (first cited locality); Jepson, Fl. W. Mid. Cal. 391 (1901), ed. 2, 366 (1911), Man. 889 (1925), all in part and excluding Man. fig. 833.

5. **N. clevelandii** Gray. Stems 1 to 2 feet high; leaf-blades ovate to lanceolate, 1½ to 5 inches long, the cauline very short-petioled or subsessile, the basal with

petioles $\frac{1}{5}$ to $\frac{1}{3}$ as long as the blade; corolla 5 to 9 lines long, its limb 3 to 5 lines broad, its tube short ($\frac{1}{4}$ to $\frac{1}{3}$ as long as the throat); filaments glabrous or slightly puberulent towards the base, inserted at summit of corolla-tube.

Stream beds and sand dunes, 20 to 1500 feet: coastal Southern California from Santa Barbara Co. to San Diego Co.; Colorado Desert. South to Lower California, east to Arizona. Mar.-June.

Relationship to Nicotiana bigelovii.—In habit Nicotiana clevelandii is a somewhat diminutive N. bigelovii, says Helen-Mar Wheeler, who adds that it is also like that species in leafage, inflorescence and capsule. The corolla-limb in Nicotiana clevelandii (3 to 5 lines broad) is, however, entirely different in lobation from the limb ($\frac{3}{4}$ to 2 inches broad) of N. bigelovii. The stamens in the former are inserted at summit of the proper tube, in N. bigelovii in the upper part of the corolla-throat.

Locs.—Coastal S. Cal.: Santa Barbara (Bot. Cal. 2:476); Playa del Rey, Los Angeles Co., *Braunton* 875; West Riverside, *C. M. Wilder* 174; Chollas Valley, San Diego Co., *Cleveland*. Colorado Desert: McCoy Wash, e. Riverside Co., *Hall* 5967; Palm Springs of San Jacinto, *Parish* 20,011; sw. Colorado Desert, *Orcutt*.

Refs.—NICOTIANA CLEVELANDII Gray, Syn. Fl. 2: 242 (1878), type loc. Chollas Valley, San Diego, *Cleveland;* Jepson, Man. 888 (1925).

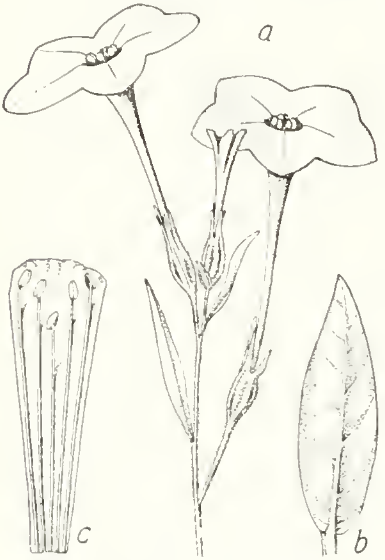

Fig. 447. NICOTIANA BIGELOVII Wats. *a*, fl. branchlet, × $\frac{2}{3}$; *b*, leaf, × $\frac{1}{2}$; *c*. long. sect. corolla-tube and -throat, × 1. The point of insertion of stamen filaments in corolla-throat is indicated by shadow marks. Below this point the filaments are adnate to the base of the corolla as line-like ridges. (In N. attenuata the filaments disappear below point of insertion at summit of tube.)

6. **N. bigelovii** Wats. INDIAN TOBACCO. (Fig. 447.) Stem commonly branching, $1\frac{1}{2}$ to 4 feet high; herbage with glandular indument, very ill-smelling; leaf-blades oblong-ovate and acute to narrowly lanceolate, 2 to 7 inches long, the cauline ones sessile (rarely some lower ones or all tapering to a shortly winged petiole or distinctly petioled), the basal leaf-blades petioled or sometimes sessile; flowers fewer than in N. acuminata, mostly scattered racemosely along the branches; calyx with slender teeth $\frac{2}{3}$ as long to as long as the tube; corolla-tube 1 to $1\frac{3}{4}$ inches long, the limb $\frac{3}{4}$ to 2 inches wide; filaments unequally inserted in the upper half of the corolla-throat, glabrous; capsule obtuse, shorter than the calyx.

Flood-plains of rivers, on mesas and open valley floors and in gullies in the foothills, 50 to 3500 feet, almost throughout cismontane California: Sierra Nevada foothills from Amador Co. to Kern Co.; Great Valley; Coast Ranges from Siskiyou Co. to San Luis Obispo Co.; coastal Southern California from northern Los Angeles Co. to San Diego Co.; also (probably as immigrant) in the western Mohave Desert. June-Oct.

Geog. note.—In the American Anthropologist (1:403–405,—1912) W. A. Setchell differentiates three varieties of Nicotiana bigelovii. The form of the central Sierra Nevada foothills, a low spreading plant with short internodes, is considered typical, that is, it rests on the formal type of the species collected at Knights Ferry, Stanislaus County. The form in the North Coast Ranges, a taller plant (2 to 6 feet high) with erect branches and long internodes, he separates as a distinct variety (later called var. exaltata Setchell). In both this and the typical form the ovary shows a tendency to be 3-celled in the sense that a few capsules in most vigorous plants exhibit this feature. In the var. wallacei of Southern California, a plant of more slender habit and smaller flowers, he finds the capsule to be uniformly 2-celled. These three varieties are described as geographically segregated, although the representation in the Great Valley connects geographically the North Coast Range area and the central Sierra Nevada foothills, while the representation in the South Coast Ranges connects geographically the North Coast Ranges and the coastal Southern

California area. His paper is, however, devoted primarily to aboriginal uses of the plants, not to the systematic botany.

In Oregon and Washington, Nicotiana bigelovii is represented by a form called Nicotiana multivalvis Lindl. (Bot. Reg. t. 1057,—1827, cult. in England, the seed collected on the Columbia River, *Douglas*), and in Montana by a form called Nicotiana quadrivalvis Pursh (Fl. 141,—1814, "on the Missouri, principally among the Mandan and Ricari nations," *Lewis*). In the northwest these two forms have been cultivated immemorially by the native tribes as a smoking tobacco. Nicotiana multivalvis and N. quadrivalvis are, without reasonable doubt, cultural mutants derived from N. bigelovii. Even before the coming of the white man in western America, the seed and the leafage of Nicotiana bigelovii, it seems certain, were articles of barter on the Indian trading routes. Because of similarity between Nicotiana bigelovii and N. quadrivalvis and by reason of evidence derived from crosses between them E. M. East (Bot. Gaz. 53:246) was convinced (some thirty years ago) that N. quadrivalvis was really N. bigelovii var. quadrivalvis. The ovary of Nicotiana quadrivalvis is 4-celled, that of N. multivalvis is several-celled. Not only is the ovary of Nicotiana multivalvis several-celled but typically an extra circle of carpels is found outside the central carpels. While the ovary is thus a monstrosity, this peculiar ovarian structure is regularly inherited. In connection with the multicellular ovaries and capsules of these two forms it is of great interest that Nicotiana bigelovii, as observed by W. A. Setchell (see above), occasionally shows a 3-celled ovary in the North Coast Ranges.

The distribution of Nicotiana bigelovii in California is validated by the following citations. Sierra Nevada foothills: Drytown, Amador Co., *Hansen;* Columbia, Tuolumne Co., *Jepson* 6342; near Hideaway Ranch, east of Hildreth, Madera Co., *Hormay* 148; Toll House, Fresno Co., *Hall & Chandler;* Breckenridge Mt., Kern Co., *Bauer* 6a. Great Valley: Princeton, Colusa Co., *Davy* 4304; Vacaville, *Jepson* 21,246; French Camp, San Joaquin Co., *Sanford;* Bakersfield, *Davy* 1736 (some upper cauline leaves subcordate at base). Coast Ranges: Callahan, Siskiyou Co., *Alexander & Kellogg;* Willow Creek, Trinity River, *Tracy* 3500; Feltz Creek, Hopland, *Jepson* 9437; Mt. Hanna, w. Lake Co., *Jepson* 21,249; St. Helena, *Jepson* 21,248; Neponset, Salinas Valley, *Abrams* 4087; New Idria, w. Fresno Co., *Guirado* 764; Cuyama Valley, se. San Luis Obispo Co., *Jepson* 12,164. Mohave Desert: Victorville, *Hall* 6187.

Coastal Southern California is inhabited by the var. WALLACEI Gray, the plants 1½ to 4 feet high, the calyx-teeth little surpassing the capsule or a little shorter, the corolla ¾ to 1 inch broad: San Francisquito Cañon, n. Los Angeles Co., *Hall* 6711; Newport Bay, *L. M. Booth* 1083; San Bernardino, *Parish* 7132; Riverside, *Jepson* 1233; Temescal Wash, *Jepson* 1582; Temecula, *C. V. Meyer* 153; Chollas Valley, San Diego, *Cleveland.* Of the foregoing collections some have the cauline leaves cuneately tapering to the sessile base, some have the cauline leaves subcordate at the base. Northward, in the Coast Ranges, vigorous individuals of Nicotiana bigelovii are also likely to show subcordate bases to the cauline leaves: Neponset, Monterey Co.; Hopland, Mendocino Co. (growing in the same colonies with the more usual leaf form); betw. Alton and Fortuna, Humboldt Co. Extreme leaf variations of a different type may also be regarded as a feature of various colonies of Nicotiana bigelovii throughout the area of its distribution in the Coast Ranges.

The center of distribution of Nicotiana bigelovii, sensu latissimo, may be evaluated as occurring in the North Coast Ranges on the basis of its abundance, individual vigor and diversity of form. Coastal Southern California may be looked upon as a secondary center. As to the Santa Barbara Islands, only one island, namely Santa Catalina, is inhabited by this species (cf. Eastwood, Lflts. W. Bot. 3:70).

Refs.—NICOTIANA BIGELOVII Wats., Bot. King 276, pl. 27, figs. 3, 4 (1871); Jepson, Fl. W. Mid. Cal. 390 (1901), ed. 2, 366 (1911), Man. 889 (1925). *N. plumbaginifolia* var. *bigelovii* Torr., Pac. R. Rep. 4:127 (1857), type loc. Knights Ferry, Stanislaus Co., *Bigelow.* Var. WALLACEI Gray, Syn. Fl. 2:243 (1878), type loc. Los Angeles, *Wallace.*

2. **ORYCTES** Wats.

Low erect annual. Stems leafy. Flowers pedicelled, borne in axillary umbels. Calyx 5-parted into narrow lobes. Corolla yellow or brownish or purple-tinged, tubular, shortly 5-toothed. Stamens unequal, inserted at base of corolla-tube, slightly exserted. Fruit a capsule with membranous pericarp, breaking open by 2 distinct valves. Seeds orbicular, flattened, margined.—Species 1. (Greek oruetes, a digger, given to this genus, says Asa Gray, because growing "in the country of the Digger Indians.")

1. **O. nevadensis** Wats. Stems few from the base, 2 to 4 inches high; herbage puberulent and somewhat scurfy; leaf-blades ovate to linear, undulate with the margins of the sinuses involute-inflexed, ¾ to 1 inch long, petioled; umbels 3 or 4-flowered; corolla 3 lines long; capsule 3 lines in diameter.

Sandy flats, 3800 to 5000 feet: Owens Valley, Inyo Co. East and north to Nevada and Idaho. May.

Locs.—Aberdeen, 4 mi. se. (Lflts. W. Bot. 2:271). Nev.: Belleville, Esmeralda Co., *Shockley* 272; Wadsworth, *Stokes.*

Refs.—ORYCTES NEVADENSIS Wats., Bot. King 274, pl. 28, figs. 5–10 (1871), type loc. Virginia Mts. (e. base, near Big Bend of the Truckee River), Nev., *Watson* 941; Wettstein in Engler & Prantl, Nat. Pflzfam. 4^{3b}:12, figs. 6d–e (1895).

3. **PETUNIA** Juss.

Viscid herbs with small entire leaves, the upper disposed to be opposite. Flowers as if solitary in the axils (really a sympodial inflorescence, each flower terminal). Calyx deeply 5-parted. Corolla funnelform. Stamens 5, conspicuously unequal, 2 long, 2 shorter and a fifth still shorter, all inserted low in the corolla-tube. Capsule ovoid, its valves elongating and separating from the partition.—Species 27, chiefly South America, only a few in North America. (Petun, an Indian name of tobacco.)

1. **P. parviflora** Juss. Prostrate annual, the stems diffusely branched from the base, 4 to 13 inches long; herbage scantily puberulent; leaf-blades linear- to oblong-oblanceolate, 2 to 8 lines long; calyx-lobes linear, almost distinct; corolla purplish-red or purplish-blue, 2½ to 4 lines long, a white distended circular spot on the upper side, the lobes apiculate; fruiting calyx twice as long as the capsule; stigma capitate; seeds reticulated.

Dried beds of former pools and sandy stream "bottoms," 5 to 700 feet: Colorado Desert; coastal Southern California; South Coast Ranges; Sacramento Valley. East to Arizona, Texas and southern Florida; also in South America. Apr.-Aug.

Note on indigenous status.—Apparently Petunia parviflora was collected by none of the early expeditions to California (1789–1860) and, it would seem, somewhat rarely from 1860 to 1900. It has been, therefore, thought by some, including the writer, to be an immigrant from warm-temperate regions in the Americas. It is, however, an obscure and easily overlooked weed-like plant. Gray makes it a native in California and describes it as "common on the seashore from Monterey Bay south" (Bot. Cal. 1:546,—1876). Parish in 1890 develops and extends this point of view (Zoe 1:302). The first collection here available is that in 1861 from Mt. Diablo (*Brewer* 835). Greene gathered it at Sacramento, doubtless about 1875. The following collections were all made since 1880, mostly since 1900. None of these stations is necessarily indicative of a native habitat, but the present evidence evaluates Petunia parviflora as a native along our southern borders with the probability that the stations in the South Coast Ranges and Sacramento Valley represent modern immigration northward. There is here cited the following localities. S. Cal.: Fort Yuma, *Parish* 8322; Escondido, *C. V. Meyer* 458; San Luis Rey River, near Pala, *Parish* 4400; Santa Ana River (mouth), *L. M. Booth* 1378; Oxnard, Ventura Co., *Condit* 24; Bletchers Bay, Santa Rosa Isl., *Abrams & Wiggins* 258. South Coast Ranges: Arroyo Grande, San Luis Obispo Co., *Alice King;* Salinas River near Salinas, *R. J. Smith* 28; Coyote sta., Santa Clara Co., *Jepson* 6197.

Petunia, generally, is a genus of plants with showy flowers. Our species is a marked exception. In his monograph, Die Arten der Gattung Petunia (Sven. Vet. Akad. Handl. 46:1–72, t. 1–7,—1911), Robert E. Fries says of Petunia parviflora: "Sie hat von allen Petunien die kleinste Blute."

Refs.—PETUNIA PARVIFLORA Juss., Ann. Mus. Paris, 2:216, t. 47 (1803), near mouth of the La Plata River, S. Am.; Jepson, Man. 888 (1925).

4. **DATURA**. L. THORN-APPLE

Ours coarse rank-smelling herbs. Leaf-blades large (mostly 3 to 10 inches long), ovate, mostly sinuate-dentate, petioled. Flowers large, solitary on short peduncles in the forks of the branching stem. Calyx tubular, 5-toothed, in our species at length cutting through near the base, the lower part persisting as a collar or rim beneath the capsule. Corolla funnelform with ample limb, convolute-plicate in the bud. Stamens included; filaments long. Stigma bilamellate. Capsule spiny, 4-valved from the top or dehiscing irregularly; placentae projecting from the axis into the middle of the cells and connecting with the walls by a partition imperfect at the top and thus forming a falsely 4-celled ovary and capsule. —As to herbage or seeds or both the species are more or less poisonous.—Species 15, all continents. (The Hindoo name, dhatura).

Calyx not prismatic; corolla large (5½ to 9 inches long), its limb 3 to 6 inches wide; capsule nodding on the short recurved pedicel, bursting irregularly, the calyx-rim rotate; seeds light-colored, flat, smoothish, with a cord-like margin; perennial..............1. *D. meteloides.*

Calyx prismatic; corolla small (2 to 5½ inches long), its limb 1 to 2 inches wide; capsule definitely 4-valved, the calyx-rim reflexed; seeds dark-colored or black, finely rugose and roughly pitted; annual.

  Capsule nodding, globose, tomentulose or pubescent, the stout prickles pubescent or glabrate..............2. *D. discolor.*

  Capsule erect, ovoid, glabrous..............3. *D. tatula.*

1. **D. meteloides** DC. TOLGUACHA. (Fig. 448.) Erect branching plant, 2 to 5 feet high; herbage glaucescent; calyx with 5 lanceolate teeth; corolla white, tinged with violet or fading lavender, 5½ to 9 inches long, its limb 3 to 6 inches wide, provided with 5 slender teeth ½ to ¾ inch long; anthers white, 6 lines long; capsule globose, 1 inch long, densely prickly, indefinitely valved or bursting irregularly, its spines short, 1½ to 3 lines long, dilated and pubescent at base.

Introduced from northern Mexico, sandy valley flats or dry hills, 24 to 4000 feet: South Coast Ranges; lower Sacramento Valley; San Joaquin Valley; Inyo Co.; Mohave Desert; cismontane Southern California; Colorado Desert. East to Texas, south to Mexico and northern South America. June-Oct.

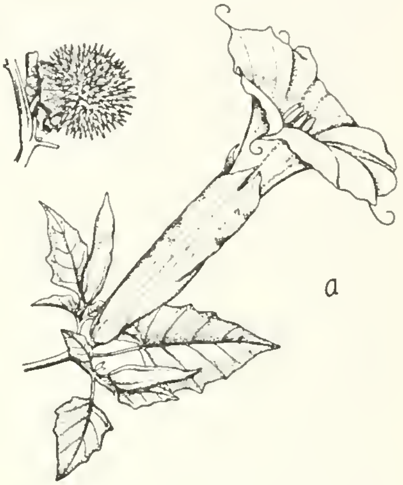

Fig. 448. DATURA METELOIDES DC. *a*, fl. branchlet; *b*, fr. × ¼.

Immigration note.—The date of entry of Datura meteloides into cismontane California, doubtless from northern Mexico, where it is native, is uncertain. It was not, apparently, collected by any of the expeditions between 1789 and 1850, nor is there any collection known to the writer prior to 1853, that at Fort Miller, Fresno Co. (Pac. R. Rep. 5^3:13). Since its occurrence in the Coast Range Valleys and Great Valley fifty to seventy years ago was characteristically associated with rich deep soils about old Spanish settlements and Mexican ranches, its introduction doubtless antedates the American occupation of California. The plant was sacred in certain religious rites of the native tribes, the whole plant being ground up and mixed with water to form a drink, the active poison of which produced delirium or even death. The essential principle was also used medicinally as an anodyne. It is therefore possible, by reason of tribal usage, that introduction may have been much earlier, that is, prior to the Spanish settlement of California. Of the vernacular name, Tolguacha, Charles F. Lummis, the distinguished student of anthropology and linguistics of the Spanish Southwest, writes: "The word is Toloache, derived from the Aztec name of the Datura, and in its Spanish form is a familiar provincialism of the Mexican states of Chihuahua and Coahuila and is common among the Indians and Mexicans of California" (Feb. 27, 1905, in Jepson Corr. 4:277. ms.)

The flowers open about nine o'clock in the evening and remain open during the next morning. Individual plants may become very large. In Surprise Cañon, Panamint Range, the writer in May, 1917, measured a plant 8 feet high and 4 feet broad, displaying flowers freely all over its periphery. Proterogyny in this species has been described by J. Schneck (Bot. Gaz. 12:223–224).

Locs.—South Coast Ranges: Peachtree Valley, San Benito Co., *Jepson;* San Miguel, Salinas Valley, *Jepson* 20,151. Great Valley: Lagoon Valley, w. Solano Co., *Jepson* 21,263; Mossdale School, San Joaquin River, San Joaquin Co., *Jepson* 8335; Manteca, *Jepson* 7718; La Grange, Stanislaus Co., *Jepson* 21,264; Friant, Fresno Co., *Jepson;* Kingsburg, *Jepson;* Lemon Cove, Tulare Co., *Jepson;* Visalia, *Jepson;* Devils Den road sta., Kern Co., *Jepson* 12,171. Inyo Co.: Hanaupah Cañon, Panamint Range, *Jepson* 6946; Shadscale Spr., Johnson Cañon, Panamint

Range, *Jepson* 19,774. Mohave Desert: Essex, *Jepson* 18,365; Lavic, *Jepson.* Cismontane S. Cal.; Santa Cruz Isl., *Abrams & Wiggins* 130; Los Sauces Creek, near Ventura, *Jepson* 20,170; Los Angeles, *E. D. Palmer;* San Bernardino, *Parish;* Horseshoe Bend, Orange Co., *Jepson;* Escondido, *C. V. Meyer* 225. Colorado Desert: Coachella, *Clary* 1553; Fort Yuma, *Parish* 8334.

Refs.—DATURA METELOIDES DC., Prodr. 13^1:544 (1852), "in calidis Novae Hispaniae regionibus," that is, Mexico; Jepson, Fl. W. Mid. Cal. 392 (1901), ed. 2, 367 (1911), Man. 887 (1925).

2. **D. discolor** Bernh. DESERT THORN-APPLE. Plants low, 1 to 1½ feet high; herbage puberulent; leaf-blades round-ovate, sinuately few-toothed or entire, 1 to 4½ inches long; corolla white with indigo flush in throat, 4 to 5½ inches long, the limb 1½ to 1¾ inches broad, with 5 slender subulate teeth; anthers white; capsule globose, nodding, its spines 5 to 7 lines long, glandular-puberulent, its collar reflexed.

River flats and "bottoms" and about cienagas, 50 to 1000 feet: Colorado Desert. East to Arizona, south to Mexico and Lower California. Sept.-Oct.

Locs.—Picacho, Colorado River, *Jepson* 5292; Ft. Yuma, *Parish;* Dixie Land, *Parish* 8336; Mountain Springs grade (foot), *Munz* 11,948.

Refs.—DATURA DISCOLOR Bernh., Linnaea, 8: Litt.-Ber. 138 (1833), "in India occidentali"; type loc. West Indies; Jepson, Man. 887 (1925).

3. **D. tatula** L. PURPLE THORN-APPLE. Plants 1 to 3 feet high; stems purplish; corolla purplish, 3 to 4 inches long, the limb 1¼ to 2 inches wide; anthers purple, 2 lines long; capsule ovoid, with many very stout subequal spines 1 to 2½ lines long.

Naturalized from tropical America on sandy flats along creeks and rivers, 50 to 1000 feet: infrequent but widely distributed throughout cismontane California. July-Sept.

Locs.—Yreka, *Butler* 1620; Bluff Creek, Klamath River, *Tracy* 6837; Dyerville, Humboldt Co., *Jepson* 16,436; Coyote Valley, s. Lake Co., *Jepson* 19,060; Santa Rosa, *Chesnut;* Fairfax, Marin Co., *Bioletti;* Carmel, *Jepson;* San Bernardino, *Parish* ("It is able to persist but not to multiply."—Dec. 1, 1904).

Refs.—DATURA TATULA L., Sp. Pl. ed. 2, 256 (1762), type loc. not given; Jepson, Fl. W. Mid. Cal. 392 (1901), ed. 2, 367 (1911), Man. 887 (1925); Parish, Muhl. 5:127 (1909).

DATURA STRAMONIUM L., Sp. Pl. 179 (1753), "habitat in America"; Safford, W. E., Jour. Wash. Acad. Sci. 11:175 (1921); Jepson, Fl. W. Mid. Cal. 392 (1901), ed. 2, 367 (1911), Man. 887 (1925). Jamestown Weed. Plants ½ to 2 feet high, the stems greenish; corolla white, 3 inches long, its limb 1 to 1¼ inches wide; capsule ovoid, the lower spines ½ to 1 line long, the upper ones 3 to 4 lines long.—Native of tropical America, adventive at a few scattered stations: Elk Mt., n. Lake Co., *Jepson* 21,265; Santa Ana River near Newport Beach, *L. M. Booth* 1345.

DATURA FEROX L., Amoen. Acad. 3:403 (1753), "habitat in China." Plants sparingly branched, 12 to 14 inches high; corolla 2 inches long; capsular spines much dilated downward, the upper ones ½ to 1 inch long.—Introduced from Asia, adventive at a few scattered stations: Lathrop, San Joaquin Co.; Stockton; Ione, Amador Co.

5. **LYCIUM.** L. DESERT THORN

Shrubs, ours rough-spiny. Leaves small, entire, usually narrow, commonly with smaller ones fascicled in the axils. Flowers pediceled, solitary or fascicled in the axils or terminal. Calyx 5 (or 4)-toothed or -lobed, persistent beneath the globular or oblong berry. Corolla tubular-funnelform to narrow-campanulate, with 5 (or 4) lobes, white, pale violet, purplish or lavender. Stamens 5 (or 4). Ovary-cells 2 to many-ovuled (1-ovuled in L. californicum). Berry 2 to many-seeded.—Species about 90, all continents. (The country Lycia, in Asia Minor.)

- Ovary and fruit without sutures; corolla wholly glabrous or glabrous with a hairy margin; corolla-lobes not revolute; filaments hairy or pubescent at base, inserted low on the corolla-tube.
  - Corolla small (2 to 6 lines long), clavate-tubular with rotate limb, or tubular-funnelform, the limb 1½ to 5 lines broad; berry red.
    - Corolla-tube not exceeding calyx to 2 times as long.
      - Calyx-lobes triangular or acute, ⅕ to ⅓ as long as calyx-tube.
        - Corolla-tube little or not at all exceeding calyx; leaves thick and fleshy, often much like a grain of wheat in shape; herbage glabrous; S. Cal. coast line..........1. *L. californicum.*

Corolla-tube 1½ to 2 times as long as calyx; leaves plane; herbage puberulent; Colorado Desert........2. *L. fremontii.*

Calyx-lobes oblong or linear (or ovate), ½ to 4 times as long as the calyx-tube; herbage minutely viscid-puberulent, rarely subglabrous; leaves plane.

Flowers borne singly; calyx cleft ⅔ to ⅘; sw. Colorado Desert....3. *L. parishii.*

Flowers usually 2 or 3 in a cluster; calyx cleft ¼ to ½; w. Colorado Desert and Santa Barbara Isls........4. *L. brevipes.*

Corolla-tube 3 to 5 times as long as calyx; mostly transmontane deserts.

Corolla-lobes with the margins felty-ciliate; corolla-tube just above calyx ½ line wide; leaves plane........5. *L. torreyi.*

Corolla-lobes with the margins glabrous or essentially so; corolla-tube just above calyx ⅓ line wide; leaves thick and fleshy, that is, jug-shaped or pear-shaped, but a little flattened (leaves plane in one var.)........6. *L. andersonii.*

Corolla large (7 to 9 lines long), its limb 7 to 9 lines broad, nearly as broad as the tube is long; calyx-lobes about 1 to 1½ times as long as calyx-tube; berry dull white or purplish; Mohave Desert and Inyo Co.; var. of........7. *L. pallidum.*

Ovary and fruit with 2 horizontal sutures, one on each side just above the middle; corolla puberulent, the sides of its lobes revolute; filaments inserted high in corolla-tube, their free portion glabrous........8. *L. cooperi.*

1. **L. californicum** Nutt. Spreading shrub, 2 to 4 feet high, with markedly spinose branchlets; herbage glabrous; leaf-blades narrowly oblanceolate, fleshy, 1 to 3 lines long, shortly and indistinctly petioled; flowers 1 or 2 in the axils, shortly peduncled; calyx cupulate, its teeth short and broad (⅕ to ⅓ length of tube); corolla white or pinkish, mostly 4-lobed, shortly narrow-campanulate, 2 to 3 lines long, its limb nearly as broad, its throat not exceeding the calyx or only slightly; filaments with a dense and well-defined ring of hairs below the middle; berry ovoid, salmon-color, 1¾ to 2½ lines broad, 2-seeded.

Dry hillslopes or tops of bluffs or ridges, 5 to 500 feet: along or near the coast line of Southern California from Los Angeles Co. to San Diego Co. South to Lower California. Apr.-Aug.

Field note.—A very spinose shrub Lycium californicum is fairly distinctive in aspect, partly so on account of its leaves which are often much thickened and as small as a grain of wheat.

Locs.—Santa Catalina Isl., *Fosberg;* Huntington Beach, *R. A. Casod;* Oceanside, *Alice King;* La Jolla, *Jepson* 11,879.

Refs.—Lycium californicum Nutt.; Gray, Bot. Cal. 1:542 (1876), type loc. San Diego, *Nuttall;* Jepson, Man. 890 (1925).

2. **L. fremontii** Gray. Shrub, 2 to 7 feet high; leaf-blades oblanceolate or spatulate, 3 to 7 (or 9) lines long; herbage and calyx minutely and thinly puberulent and usually a little viscid; calyx (in anthesis) cylindric, about ½ as long as corolla, its teeth short-triangular; corolla lavender or pale violet, tubular to narrow-funnelform, glabrous, 5 to 6 lines long, its limb 2½ to 3½ lines broad; berry red, oblong to globose, 3½ to 4 lines long.

Desert flats and washes, 150 to 1500 feet: Colorado Desert. East to Arizona, south to Mexico. Apr.

Locs.—Painted Cañon, Mecca Hills, *Jepson* 11,644; Santa Rosa Mts. (wash at base), *L. J. Childs;* Borrego Spr., *T. Brandegee;* Split Mt., *T. Brandegee;* Signal Mt., *T. Brandegee;* Purple Hills Pass, Colorado River, *Jepson* 5295a.

Refs.—Lycium fremontii Gray, Proc. Am. Acad. 6:46 (1862), "interior of Cal. or country east of it," *Fremont,* in 1849; Jepson, Man. 891 (1925).

3. **L. parishii** Gray. Shrub 1 to 4 feet high, the branchlets glandular-puberulent; leaf-blades narrowly obovate to oblanceolate, minutely glandular-puberulent, 1 to 3 lines long, subsessile; flowers mostly 1 in the axils; calyx puberulent, about half as long as corolla, cleft ⅔ to ⅘ to base into linear lobes; corolla purple, tubular-funnelform, 3 to 5 lines long, its limb 2½ to 4 lines broad, the lobes somewhat rotate, ¼ to ⅓ as long as the tube; berry ovoid, red, 2 to 3 lines long.

Mesas and cañons, 1000 to 2000 feet: San Bernardino Valley; southwestern Colorado Desert. East to Arizona, thence south to Sonora. Apr.

Tax. note.—Collections from the southwestern Colorado Desert (Mountain Palm Spr., e. San Diego Co., *Hitchcock;* Vallecito, *T. Brandegee*) and from Arizona (Quartzite, *Kearney & Peebles* 10,221), exhibit the calyx in anthesis ½ to ⅘ cleft to the base into linear lobes. In material from the type locality, on the mesa north of San Bernardino, *Parish* 795, the calyx is cleft half-way (or slightly less) into ovate lobes. There had been only a single shrub at the type locality, says Parish, and it was long since destroyed.

Refs.—Lycium parishii Gray, Proc. Am. Acad. 20:305 (1885), type loc. mesa near San Bernardino, *S. B. & W. F. Parish;* Jepson, Man. 891 (1925). *L. pringlei* Gray, l.c., without indication of locality, country or collector but the type from nw. Sonora, Mex., *Pringle* (acc. Ann. Mo. Bot. Gard. 19:287).

4. **L. brevipes** Benth. Thorny shrub, 3 to 8 feet high, with very divaricate branches; herbage minutely viscid-puberulent or subglabrous; leaf-blades oblanceolate or spatulate, thick but plane, 2 to 6 (or 12) lines long, shortly and indefinitely petioled; calyx about half the length of the corolla, its lobes oblong or linear, ½ to as long as the tube; corolla pale blue (fading dull white promptly), funnelform, 4 to 6 lines long, its limb 3 to 5 lines wide, its lobes ½ to ⅔ as long as the tube; stamens a little exserted; berry red, globose, 2 to 3 lines broad.

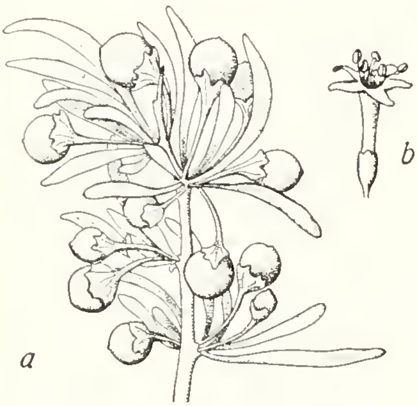

Fig. 449. Lycium torreyi Gray. *a*, fr. branchlet, × 1; *b*, fl., × 1½.

Sandy washes, 5 to 150 feet: western Colorado Desert; San Clemente Isl. South to Lower California and Mexico. Apr.

Locs.—Colorado Desert: Dos Palmas Spr., *Munz* 9964; Silent Cañon, se. end Santa Rosa Mts., *Jepson* 11,713; Borrego Spr., *Jepson* 8873; San Felipe Narrows, *Jepson* 17,110; Dixieland, *Munz & Hitchcock* 12,112. San Clemente Isl., *Trask* 28.

Var. **hassei** C. L. Hitchc. Stems mostly unarmed; calyx-lobes 1 to 3 times as long as the tube.—Santa Catalina Isl.

Field note.—In 1899 Blanche Trask made record (Erythea, 7:140) of an individual of var. hassei at Avalon as follows: It "forms an impenetrable arbor-like network, about one hundred feet in circumference and twenty-five feet in height. Dr. H. E. Hasse says it has grown rapidly, since he first noted it, over ten years ago. Its pale lavender flowers and small red berries are always seen on its virgate branches. The largest branches are six inches in diameter." This gigantic bush has since been destroyed by "the march of improvements."

Refs.—Lycium brevipes Benth., Bot. Sulph. 40 (1844), type loc. Magdalena Bay, L. Cal., *Hinds. L. richii* Gray, Proc. Am. Acad. 6:46 (1861), type loc. La Paz, L. Cal., *Rich.* Var. hassei C. L. Hitchc., Lflts. W. Bot. 1:58 (1933). *L. hassei* Greene, Pitt. 1:222 (1888), type loc. Santa Catalina Isl., *Hasse & Lyon. L. richii* var. *hassei* Jtn., Proc. Cal. Acad. ser. 4, 12:1154 (1924). *L. richii* Jepson, Man. 891 (1925), in part. *L. verrucosum* Eastw., Proc. Cal. Acad. ser. 3, 1:111 (1898), type loc. San Nicolas Isl., *Blanche Trask.*

5. **L. torreyi** Gray. Squaw Thorn. (Fig. 449.) Roughish erect shrub with divaricate flexuous branchlets, often sparingly thorny, 4 to 8 feet high; herbage mostly glabrous; leaf-blades linear-oblanceolate or oblong, ½ to 1¼ inches long, mostly narrowed below to a short petiole-like base; flowers mostly 3 to 7 in a fascicle; calyx-teeth minute, puberulent; corolla lavender-purple, tubular-clavate with spreading limb, 5 to 6 lines long, the limb 2½ to 3½ lines broad, its rotately spreading lobes with a well-defined, densely ciliate or tomentulose margin; berry bright red, globose, 3 lines broad.

Along washes and stream "bottoms," 150 to 2000 feet: eastern Mohave Desert; Colorado Desert. East to Texas, south to Mexico. Mar.

Field note.—In some localities, as in the Colorado River "bottoms" and in the washes about Barstow, this shrub occurs in considerable abundance. In "good years" there may be "five crops" of the berries which are harvested by women of the native tribes. A basket is hung over the back and the red berries, crowded thickly on the long branches, are gathered and thrown over the left shoulder into the basket. The desert tribesmen are extremely fond of them and say that in words of the white man's language they may be called "Indian Grapes."

Locs.—Mohave Desert: Barstow, *Jepson* 6640; Ludlow, *Jepson* 5498; Needles, *Jepson* 5484. Colorado Desert: Palo Verde, ne. Imperial Co., *Hitchcock* 12,195; Fort Yuma, *Parish* 8491; Carriso Creek, e. San Diego Co., *T. Brandegee.*

Refs.—LYCIUM TORREYI Gray, Proc. Am. Acad. 6:47 (1862), type loc. Fort Yuma, Cal., *Thomas* (type selected by Hitchcock, Ann. Mo. Bot. Gard. 19:282, from six collections cited in original diagnosis); Jepson, Man. 890 (1925).

6. **L. andersonii** Gray. WATER JACKET. Intricately branched scraggly shrub with needle-like spines, 1 to 3 or 5 feet high, usually glabrous; leaf-blades spatulate or linear-spatulate, at least those of the fascicles pear-shaped or like a rice grain but a little flattened, that is very thick and watery, 1½ to 3 or 6 lines long, on short almost filiform petioles ¼ to ½ line long; flowers 1 or 2 in a place, either 4 or 5-merous (even on same branchlet); calyx very small, glabrous, submembranous, ⅙ to ¼ length of corolla, its teeth almost minute; corolla white-lavender, aging buckskin-color, narrowly tubular-funnelform, glabrous (or the lobes very minutely ciliate), 4 to 6 lines long, the lower part of its tube about ⅓ line wide, the limb 2 to 2½ lines wide, its lobes ⅙ as long as corolla; stigma green; berry elliptic, 1½ to 2 lines long, red or at first chrome-yellow.

Dry stony hills, 200 to 5000 feet: Mono and Inyo Cos.; Mohave Desert; cismontane Southern California; Colorado Desert. East to Utah and New Mexico, south to Lower California and Mexico. Jan.-May.

Field note.—The numerous branchlets are densely crowded with axillary fascicles of jug-like or pouch-like leaves, suggestive, when crushed, of tiny bags of water, pearshaped-globose but slightly flattened.

Locs.—Mono and Inyo Cos.: Mono Lake (Ann. Mo. Bot. Gard. 19:274); Black Cañon, White Mts., *Duran* 577; Hanaupah Cañon, Panamint Mts., *Jepson* 6987. Mohave Desert: Granite Mts. (s. of Avawatz Mts.), *Jepson* 17,309; Dominguez Ranch, Providence Mts., *Jepson* 18,269; Old Dad Mts., *Jepson* 20,408; Ord Mt., *Jepson* 5932; Barstow, *Jepson* 6612; Kramer, *Jepson* 5328; Lancaster, *Parry*. Cismontane S. Cal.: Aguanga, sw. Riverside Co., *Howell* 3274; San Diego (Ann. Mo. Bot. Gard. 19:277). Colorado Desert: Corn Sprs., Chuckwalla Mts., *Munz & Keck* 4850; Vallecito, e. San Diego Co., *Jepson* 8585; Mountain Springs grade (summit), e. San Diego Co., *Jepson* 11,811.

Tax. note.—The leaves of Lycium andersonii are thick-teretish and fleshy, sometimes a little plane but always succulent. The leaves of Lycium torreyi are broad, plane, not fleshy, typically glaucescent in appearance. The corolla-tube of Lycium andersonii is narrow, almost filiform at base, the corolla-lobes glabrous or minutely and sparsely ciliate. The corolla-tube of Lycium torreyi is obviously a little broader than in L. andersonii, the corolla-lobes with a ciliate border which is typically felty-ciliate

Var. **deserticola** (Hitchcock) Jepson comb. n. Very leafy-fasciculate, the leaf-blades narrow-oblanceolate, thin, plane, ½ to 1¼ inches long, ½ to 1½ lines broad.—Southern Sierra Nevada in Kern Co. (Poso Mine, Greenhorn Mts., *C. N. Smith* 182); Mohave Desert (Old Dad Mts., Ann. Mo. Bot. Gard. 19:280); north and west sides of the Colorado Desert (Riverside Mts., *Jepson* 5240; Shavers Well, *Jones;* San Felipe Cañon, e. San Diego Co., Ann. Mo. Bot. Gard. 19:281); cismontane S. Cal. (Riverside, *F. M. Reed*). The leafage of this variety is entirely different from that of the species; so much so that it seems unnatural to include this thin-leaved shrub and the succulent-leaved L. andersonii in one taxonomic unit.

Refs.—LYCIUM ANDERSONII Gray, Proc. Am. Acad. 7:388 (1868), type loc. Silver Peak (acc. isotype label), Nev., *Anderson* 151; Jones, Zoe 5:42 (1900); Jepson, Man. 890 (1925). Var. DESERTICOLA Jepson. *L. andersonii* f. *deserticola* C. L. Hitchc., Ann. Mo. Bot. Gard: 19:280 (1932), type loc. Palm Sprs. of San Jacinto, *Parish* 4132. *L. torreyi* var. *wrightii* Jepson, Man. 891 (1925), not L. andersonii var. wrightii Gray.

7. **L. pallidum** Miers var. **oligospermum** C. L. Hitchc. RABBIT THORN. (Fig. 450.) Densely branched excessively thorny shrub, 1½ to 3 feet high and as broad, the branchlets flexuous; herbage glabrous; leaf-blades oblong-oblanceolate, slightly glaucous, ½ to 1 inch long (the lower leaves of young plants spatulate-obovate, 1 to 2½ inches long); flowers pendulous from the under side of the spreading branches; calyx less than half the length of the corolla, its lobes oblong, spreading, equaling or exceeding the calyx-tube; corolla narrow-campanulate, pure white to lavender, fading to pale yellow, 7 to 9 lines long, its limb 7 to 9 lines broad; stamens

exserted; berry slightly depressed-globose, dull or greenish white, glaucous, 4 to 6 lines broad.

Dry stony hills and mesas, 500 to 2000 feet: Inyo Co.; central Mohave Desert. Mar.-Apr.

Field note.—In winter Lycium pallidum var. oligospermum is deciduous and it is at such time that its thorniness comes into full prominence—hundreds of thorns bristling all over the shrub, thickly set along all the stems and branches. Save for representatives of Cactaceae this species is the thorniest shrub in the central Mohave Desert. Towards the end of February the leaf-buds burst, and after this time the thorns are masked by tender light green foliage. Even when mature the leaves are succulent and contain more water than the leaves of most other desert shrubs. The flowers usually appear early in March.

Locs.—Inyo Co.: Argus Range, *Epling & Anderson.* Mohave Desert: Slate Range, *Allison Krames;* Garlic Spr., near Tiefort Mt. (Ann. Mo. Bot. Gard. 19:305); Barstow, *Jepson* 6148.

Refs.—LYCIUM PALLIDUM Miers, Ann. & Mag. Nat. Hist. ser. 2, 14:132 (1854), type from N. Mex., *Fendler* 670. Var. OLIGOSPERMUM C. L. Hitchc., Ann. Mo. Bot. Gard. 19:304 (1932), type loc. Barstow, *Jepson* 6606. *L. pallidum* Jepson, Man. 890 (1925).

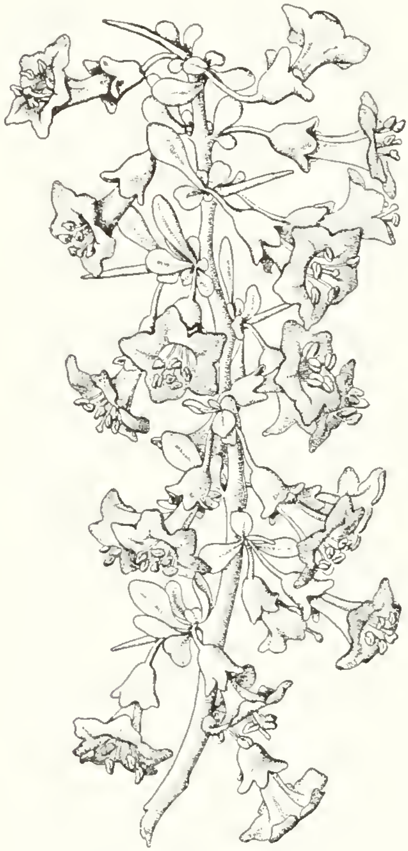

Fig. 450. LYCIUM PALLIDUM Miers var. OLIGOSPERMUM C. L. Hitchc.; fl. branchlet, × 1.

6. **L. cooperi** Gray. PEACH THORN. (Fig. 451.) Thorny compact densely leafy shrub, 2 to 4 (or 8) feet high, the branches and branchlets set mostly at right angles; bark smooth, dark red or sometimes whitish, in age black; herbage and calyx minutely pubescent and more or less viscid; leaf-blades oblanceolate or oblong, 4 to 8 (or 12) lines long, narrowed to a short petiole; calyx cylindric with truncate base or in fruit enlarged and bowl-shaped, its broad lobes ½ to as long as the tube; corolla greenish-white, funnelform, minutely and rather weakly puberulent, rarely quite glabrous, 5 to 6 lines long, about twice the length of the calyx, its limb 4 to 5 lines broad, its lobes rotate, later recurving, the sides revolute in such a way as to give a horn-like appearance to each lobe; ovary with 2 horizontal sutural depressions, one on each side above the middle; fruit short-cylindric or a little contracted at apex, subglobose, 3 to 4 lines high, hard or bony at maturity, the lateral sutures conspicuous.

Desert cañons and mesas, 500 to 4000 feet: upper San Joaquin Valley; Sierra Nevada in Kern Co.; Inyo Co.; Mohave Desert; Colorado Desert (ranges on west and north borders). East to the Colorado River Valley and southwestern Utah. Apr.-June.

Field note in the Calico Mts.—On the mesas north of Barstow, in the Calico Wash, in the Calico Mountains and on the Coolgardie Yucca Mesa this species is frequent and was here first studied by the writer as a field subject in the winter and spring of the years 1915–1916. In the Calico Mountains the shrubs are densely floriferous on the under side of the branchlets which often bear as many as 38 flowers in the space of two inches. The fruit, it was found, is marked by a distinctive feature, namely two transverse sutures, one on each side of the berry above the middle, a peculiarity so remarkable that, since not described in any book, it was thought in the field to indicate a new entity. But these structures proved to be a mark truly characterizing Lycium cooperi and distinguishing it from all other American species of the genus. Years later this feature was briefly noted in the writer's Manual (1925). In early anthesis the sutures lie very near the base of the ovary. During the period of maturation of the fruit this basal part elongates conspicuously, although the upper portion or "cap" changes but little. Less abundant than Lycium pallidum var. oligospermum, Lycium cooperi grows in the Mohave Desert mostly at higher altitudes than that very different shrub.

Locs.—Upper San Joaquin Valley: McKittrick Hills, w. Kern Co., *Jepson* 17,027; betw. Rose sta. and Bakersfield, *Jepson* 8943. Southern Sierra Nevada in Kern Co.: Weldon, *Voegelin* 77. Inyo Co.: Inyo Range, *Kerr;* Darwin, *Ferris* 7912. Mohave Desert: New York Mts., *Jepson* 5448; Hole-in-the-Wall, Providence Mts., *Jepson* 18,323; Calico Mts., *Jepson* 6701; Kramer, *Jepson* 5329; Cameron sta., lower Tehachapi Pass, *Jepson* 20,608 (shrub about 14 feet broad and 5 feet high); Little Rock Creek, n. slope San Gabriel Mts., *Peirson* 1086; Llano Verde, near Little Rock, *Davy* 2309. Colorado Desert: Cottonwood Spr., Eagle Mts., *Jepson* 12,612; Lookout Mt., n. of Indio, *Jepson* 5978; San Felipe Valley, *C. V. Meyer* 70.

Refs.—Lycium cooperi Gray, Proc. Am. Acad. 7:388 (1868), type loc. Providence Mts., *Cooper;* Jepson, Man. 891 (1925). *L. cooperi* var. *pubiflorum* Gray, Syn. Fl. 2:238 (1878), type loc. Mohave River [headwaters], *Palmer*, a form with the corolla more strongly pubescent. *L. shockleyi* Gray, Proc. Am. Acad. 22:311 (1887), type loc. Candelaria, Nev., *Shockley.*

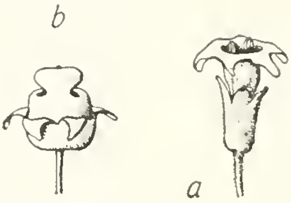

Fig. 451. Lycium cooperi Gray. *a*, fl. × 1; *b*, fr. × 1¼.

Lycium halimifolium Mill., Gard. Dict. ed. 8, Lycium no. 6 (1768), type from Asia. Matrimony Vine. Spreading loose shrub, 2 to 4 feet high; leaf-blades ovate-lanceolate, 1 to 2¼ inches long, glabrous, shortly petioled; flowers in axillary clusters of 1 to 3, the pedicels 4 to 5 lines long; calyx cupulate, its triangular lobes half as long as the tube; corolla lavender, rotate-campanulate, 4 to 5 lines broad, about 2½ times as long as the calyx; berry ovoid, salmon-color, about 4 lines broad.—Native of southeastern Europe and Asia, sparingly adventive at scattered stations in Cal.: Beckwith, Sierra Co. (in 1903); Jackson, Amador Co. (in 1933); Campbell Creek, Saratoga (in 1906); San Diego (in 1936,—Cal. Dept. Agr. Bull. 25:611).

Lycium chinense Mill., Gard. Dict. ed. 8, Lycium no. 5 (1768), type from China. China Box-thorn. Rambling shrub, the branches 2 to 7 feet long; leaf-blades rhombic-ovate, ¾ to 1½ inches long; flowers 2 to 4 in sessile axillary clusters, the pedicels 4 to 5 lines long; calyx cupulate, its lobes ⅓ as long as the tube; corolla funnelform-campanulate, purple, 5 lines long, the lobes nearly equaling throat and tube; berry ovoid, scarlet.—Native of Asia, adventive in Solano Co. (Cal. Dept. Agr. Bull. 26:565); "weedy in habit."

Lycium barbinodum Miers, Ann. & Mag. Nat. Hist. ser. 2, 14:138 (1854), type loc. Sierra Madre, n. Mexico, *Seemann* 2090. Old thorns or nodes densely short-woolly; corolla 2 lines long, about equaling the 2 to 3-cleft calyx, its lobes short.—Native of Mexico, adventive at San Bernardino, acc. *Parish* (Muhl. 8:81).

Salpichroa Miers. Herbs or shrubs with entire leaves. Flowers solitary on axillary peduncles. Calyx 5-parted. Corolla (in ours) white, urceolate-campanulate, shortly 5-lobed, its lobes recurving; corolla-tube (in ours) with a woolly ring below the middle within. Stamens inserted on the corolla-tube near the middle; anthers a little exserted. Fruit an ovate berry. S. rhomboidea Miers; Hook., Lond. Jour. Bot. 4:326 (1845). *Atropa rhomboidea* Gill. & Hook., Bot. Misc. 1:135, t. 37 (1830), type loc. Buenos Aires, Argentina, *D. Gillies.* *Perizoma rhomboideum* Small, Fl. Se. U. S. 991 (1903). Stems branched, spreading or trailing, 2 to 5 feet long, arising from slender rootstocks; leaf-blades rhomboid-ovate, ½ to 1½ inches long, on petioles ⅓ as long to as long; calyx-lobes subulate; corolla about 3 lines long, constricted a little below the lobes, the lobes about ⅓ the length of tube; filaments hairy at base; ovary imbedded in an annulate disk or peripheral zone of red-orange tissue on lower half; style hairy on lower part; berry "yellow."—Native of South America, rarely adventive in gardens, cultivated fields and vacant lots, 20 to 500 feet. First collected in California, April, 1930, by R. E. Goble on the ranch of J. Tartaglia at San Luis Obispo where, on account of its running rootstocks, it proved itself an undesirable weed in fields. Also at Eureka, *Tracy* 12,972, and reported at Santa Cruz and Oakland.

6. SOLANUM L. Nightshade

Herbs or the stems sometimes suffrutescent. Flowers in umbels, cymes or racemes borne on short lateral or terminal peduncles. Calyx 5-parted. Corolla rotate, 5-lobed, with scarcely any tube. Anthers almost sessile, lightly connate into a cylinder surrounding the style, opening by a small pore at the apex or longitudinally dehiscent. Fruit a berry with several seeds.—Species about 1200, all continents. (Latin name of the Nightshade, from solamen, quieting.)

Stems unarmed.
Peduncles much shorter than the pedicels or almost none, thickened into a cupulate node at the insertion of the pedicels; corolla large (mostly ½ to 1¾ inches broad), 5-angled or 5-lobed, with greenish glands at base; perennial.
Leaf-blades entire (rarely a few blades with 1 or 2 pairs of teeth or lobes at base).
Herbage viscidulous (except in 3 vars. of no. 1); hairs mostly unbranched.
Leaf-blades entire (rarely with a pair of teeth or lobes at base); mainland, mostly of the interior..........1. *S. xantii.*
Leaf-blades crenate; Santa Barbara Isls..........2. *S. wallacei.*
Herbage not viscid; hairs mostly branched; leaf-blades commonly entire.
Stems and leaves green; Contra Costa Co. to Santa Clara Co...3. *S. umbelliferum.*
Stem and leaves white-tomentulose; Contra Costa Co. to Santa Barbara Co.......4. *S. californicum.*
Leaf-blades mostly hastate, that is, with a pair of salient linear lobes at base; se. San Diego Co..........5. *S. tenuilobatum.*
Peduncles longer than the pedicels; corolla small, 5-cleft.
Perennial; corolla 4 to 7 (or 8) lines broad; South Coast Ranges, S. Cal., Inyo Co..........6. *S. douglasii.*
Annual; introduced weeds.
Leaf-blades entire or toothed or undulate; corolla 1 to 2½ (or 3½) lines broad.
Herbage glabrous, the stem-angles scabrous; berry black..........7. *S. nigrum.*
Herbage villous; berry yellow or green..........8. *S. villosum.*
Leaf-blades pinnately parted; corolla 3 to 4 lines broad; berry green..........9. *S. triflorum.*
Stems armed with long straight prickles; introduced weeds.
Perennial; berry not enclosed in the calyx, the calyx not prickly..........10. *S. elaeagnifolium.*
Annual; berry wholly enclosed by the calyx, the calyx prickly..........11. *S. rostratum.*

1. **S. xantii** Gray. Stems herbaceous, several to many from a woody root-crown, erect or decumbent, sometimes prostrate, mostly simple, slender and sparsely leaved, 1½ to 2 feet high, the hairs minute and thin to dense and long, but always spreading and more or less viscid; herbage typically gray-pubescent, sometimes green; leaf-blades thinnish, elliptic-ovate to narrow-ovate, at base obtuse, truncatish or subcordate, commonly entire, ¾ to 1½ (or 3) inches long, the pubescence thin, consisting of simple short or very minute hairs; petioles 2 to 7 lines long, furnished with hairs like the stems; flowers few in an umbel; pedicels and calyx usually pubescent; corolla light azure or fading darker blue (the center marked by a pair of greenish spots below each lobe), 5 to 10 lines broad.

Mountain slopes and foothills, 10 to 5300 (or 7000) feet: cismontane and intramontane Southern California from the Laguna, San Bernardino and San Gabriel mountains to northern Ventura and Santa Barbara Cos.; Tehachapi Mts.; Sierra Nevada from Kern Co. to Eldorado Co.; South Coast Ranges from San Luis Obispo Co. to Santa Clara Co. (rare in this area); North Coast Ranges from Marin Co. to Humboldt Co. (intermediate to var. intermedium). South to Lower California and east to Arizona. May-June.

Note on polymorphism.—The habit of Solanum xantii is somewhat polymorphic; leaf shape and leaf size are markedly polymorphic, while pubescence and glandulosity vary markedly in degree. The type locality is Fort Tejon. In this region, the region of the Tehachapi Mountains and the mountains of Ventura and Santa Barbara counties, this species is well developed. Although no two collections from different stations in this area are alike in leafage and viscidity and often unlike in aspect, they must be considered conspecific with the botanical type, since such differences as exist are not taxonomically important. For this region the following stations are cited: Tehachapi Mts., *Jepson* 6716 (Rowen), 18,395 (Keene); Seymour Creek, Mt. Piños, *Hall* 6487; Purisima Hills, n. Santa Barbara Co., *Jepson* 11,946; Sycamore Cañon, Santa Inez Mts., *Jepson*

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